FINAL REGULATORY IMPACT AND REGULATORY FLEXIBILITY ANALYSIS OF FINAL RULE 30 CFR PARTS 7, 36, 70, AND 75

STANDARDS FOR UNDERGROUND COAL MINES

U.S. Department of Labor
Mine Safety and Health
Administration
Office of Standards,
Regulations, and Variances

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I. EXECUTIVE SUMMARY

INTRODUCTION AND SUMMARY

The Mine Safety and Health Administration (MSHA) is establishing standards and regulations for diesel-powered equipment in underground coal mines. Coal mine operators began to introduce diesel-powered equipment into underground mines in the early 1970's. The number of diesel units operating in underground coal mines has increased from approximately 150 in 1974, to over 2,900 units operating in 173 mines in 1995. MSHA projects that the number of diesel units operating in underground coal mines could increase to approximately 4,000 in 250 underground coal mines by the year 2,000.

The final rule sets tests and specifications for MSHA approval of diesel engines and related components to ensure that they operate cleanly and do not introduce fire or explosion hazards in the confined, potentially gassy underground coal mine environment. In addition, the final rule requires that diesel engines be properly maintained and that miners workplaces be checked for elevated concentrations of hazardous diesel exhaust emissions. The final rule also sets standards for safe fuel handling and storage, and requires certain proven safety features for diesel-powered equipment ranging from methane monitors to canopies to protect equipment operators from cave-ins.

Executive Order 12866 requires that regulatory agencies assess the cost and benefits of any rule having major economic consequences for the national economy, an individual industry, a

geographic region, or a level of government. The Regulatory Flexibility Act (5 U.S.C 601 et seq.) similarly requires regulatory agencies to consider the rule's impact on small entities. For the purposes of the Regulatory Flexibility Act, MSHA has traditionally, by policy, determined a small entity to be one employing fewer than 20 employees. MSHA's final regulatory flexibility analysis, discussed in detail later in part V, comports with the requirements of the Regulatory Flexibility Act. MSHA has determined that these standards and regulations would not have a major effect of $100 million or more on the economy.

INDUSTRY CHARACTERISTICS

For many years diesel-powered equipment has been used in underground metal and non-metal mines. During the past 20 years such equipment has been increasingly used in coal mines. The number of diesel-powered equipment operating in underground coal mines has increased from 150 units in 1974 to over 2,900 units operating in 173 mines in 1995. Of these 173 mines, 158 are large mines and 15 are small mines.

BENEFITS

The final rule establishes comprehensive and integrated requirements governing diesel-powered equipment used in underground coal mines. Compliance with the rule will minimize fire, explosion, fuel handling and storage hazards. The hazards

of diesel engine exhaust are minimized by design and performance standards for diesel engines and maintenance. Other safety hazards associated with the use of diesel-powered equipment in underground coal mines are also addressed.

The final rule includes tests and specifications for MSHA approval of diesel engines. These requirements will result in clean operating diesel engines appropriate for use in the confined underground mine environment, which will reduce miners' exposure to harmful emissions. The final rule sets test procedures and limits on the concentrations of carbon monoxide, oxides of nitrogen, and establishes the quantity of ventilating air necessary to dilute these exhaust contaminants to safe levels. The rule also contains tests and specifications for diesel engine components, which ensure that diesel engines are fire and explosion-proof.

The final rule also requires diesel-powered equipment to be equipped with certain basic safety features. These safety features will result in reduced fire hazards and lower risk of accidents involving diesel-powered equipment. The final rule requires fire-protection features, including fuel, hydraulic, and electrical system protections; and properly designed, installed and maintained fire suppression systems. Diesel-powered equipment is also required to have basic safety features, such as brakes and lights. In addition, the rule extends to diesel-powered equipment safety measures that apply to electric-powered equipment and that have proven to protect miners from cave-ins

and explosions.

The final rule also addresses diesel-powered equipment when in operation underground. The rule provides for a systematic approach to the clean and safe operation of diesel-powered equipment. To accomplish this, the final rule sets standards for ventilation of diesel-powered equipment, routine sampling for toxic exhaust gases in the work place, and the use of low sulfur diesel fuel to minimize emissions, and requires that maintenance be performed by trained personnel to keep diesel equipment in proper operating condition.

To ensure that the hazards associated with diesel fuel usage in the underground mine environment are properly controlled, the final rule includes requirements for the underground storage, transportation and dispensing of diesel fuel. Design, capacity, and dispensing requirements are set for diesel fuel storage, as well as safety precautions and construction requirements for underground storage facilities and areas, including automatic fire suppression systems. These provisions will reduce the risk of fires involving diesel fuel.

The final rule also extends several longstanding safety requirements for electric equipment to diesel-powered equipment. The final rule requires certain diesel equipment to be installed with methane monitors, providing miners with critical protection against methane explosions. The final rule also requires cabs and canopies to be installed on certain diesel-powered equipment, protecting miners from the dangers of roof and rib falls in the

underground mine environment.

Part III of this analysis contains a more detailed discussion of the specific safety and health hazards of diesel-powered equipment, and the benefits derived from the final rule with respect to those hazards.

COST OF COMPLIANCE

The compliance costs associated with the standards directly impact two industry groups: manufacturers of diesel-powered mining equipment; and operators of underground coal mines. Part 7, subparts E, and F relates to manufacturer costs and Parts 70 and 75 relate to operator costs. The total compliance costs of the rule is estimated to be about $10.35 million per year, of which mine operators will incur about $10.3 million per year and manufacturers will incur about $50,450 per year.

The per year cost of $10.3 million for mine operators consist of $4.9 million of annualized cost plus $5.4 million of annual costs. Of the $10.3 million, large mine operators will incur about $10.1 million, which consist of $4.8 million of annualized costs and $5.3 million of annual costs. Of the $10.3 million, small mine operators will incur about $210,800, which consist of $92,300 of annualized costs and $118,500 of annual costs.

Manufacturers will incur about $50,450 per year. The $50,450 consist of $15,900 of annualized costs and $34,550 of annual costs.

REGULATORY FLEXIBILITY CERTIFICATION

Pursuant to the Regulatory Flexibility Act of 1980, MSHA has analyzed the impact of these rules upon small businesses. MSHA has concluded that the standards and regulations for diesel-powered equipment in underground coal mines will not have a significant adverse impact upon a substantial number of underground small coal mines. MSHA has not exempted small mine operators from any provision of the final rule and has determined that small mines would benefit from the provisions of the final rule. MSHA has included provisions to minimize costs, e.g., delayed effective dates, and minimal paperwork requirements, where possible.

II. INDUSTRY PROFILE

INTRODUCTION

This industry profile briefly describes the structure and characteristics of the coal mining industry. Since this final rule primarily affects underground coal mines, this section provides information concerning the number of underground coal mines, the estimated number of employees, and other industry market characteristics. This section also provides some of this information specifically for the mines currently using diesel-powered equipment. Finally, the chapter concludes with estimates of the numbers of types of diesel-powered equipment used in underground coal mines.

PROFILE OF THE U.S. COAL INDUSTRY

Bituminous coal accounts for the largest share of all U.S. coal production. With respect to 1994 coal production estimates: about 90 percent came from bituminous and subbituminous coal; and the remainder came from lignite and anthracite coal. The principle market for U.S. coal is the electric utility industry. The 1994 coal production was allocated as follows: 79 percent was sold to electric utilities; 7 percent was exported; 3 percent was used in coke plants; and the balance was used in other industrial residential, commercial and transportation sectors.

COAL PRODUCTION

The United States produced 1.03 billion tons of coal in 1994 of which about 399.1 million tons were mined in underground mines [1, p. 7]. Using the 1994 U.S. price of $19.41 a ton [1, p. 150] for the average price of coal, the Mine Safety and Health Administration (MSHA) estimates that the total value of coal production was about $20 billion and the value of underground coal production was about $7.7 billion.

In 1994, approximately 38 percent of the coal mined in the U.S. was extracted using underground mining techniques. Underground coal mines are characterized in two ways: (1) by the method through which the seam is accessed (i.e., shaft, drift, or slope) and (2) by the mining system used to extract the coal (i.e., conventional, continuous, or longwall mining). Longwall mining can recover between 80 and 85 percent of the coal, whereas, room and pillar methods of mining that use conventional and continuous methods, can recover about 50 to 60 percent of the coal.

Table II-1 below provides industry information for 1995 on the number of underground coal mines and miners by number of miners employed per mine. The data in Table II-1 are preliminary estimates. For purposes of this final Regulatory Impact Analysis (RIA) and the final Regulatory Flexibility Act (RFA), coal mining

TABLE II-1

DISTRIBUTION BY SIZE OF UNDERGROUND COAL MINES IN THE U.S. 1995 - PRELIMINARY DATA

Detail	Number of Mines	Percent of All Mines	Number of Miners	Percent of All Miners
Small Mines				
1 - 19	466	43.5	4,630	8.6
Large Mines				
þ 20	606	56.5	49,370	91.4
Total Mines	1,072	100	54,000	100

Source: U.S. Department of Labor, Mine Safety and Health Administration. Denver Safety and Health Technology Center. Coal 1995 Size-Group Report (Quarters 1 thru 4 \ Preliminary Data) - CM441, cycle 95/086. Unpublished data. April, 1996. [2]

operations have been separated into two categories: (1) those operations having 20 or more employees; and (2) those operations classified as small businesses, having fewer than 20 employees. Over the past 20 years, for rule making purposes, MSHA has consistently used this small mine definition. This rulemaking has been consistent with the Small Business Act and the Regulatory Flexibility Act. MSHA sought and received early public participation in the rulemaking. In addition, MSHA has included alternatives which both respond to commenters' concerns and minimize burdens on the mining public. As will be discussed in the various sections of the preamble, MSHA's final Regulatory Flexibility Analysis meets the Regulatory Flexibility Act's requirements particularly as it covers small businesses. As can be seen in Table II-1, 43.5 percent of all underground coal mines (466 mines out of 1,072 mines) are small mines that employ about 8.6 percent of all underground coal miners (4,630 miners out of 54,000 miners). In addition, about 91.4 percent of all underground miners are employed by 56.5 percent of mines that employ at least 20 miners.

PROFILE OF MINES USING DIESEL-POWERED EQUIPMENT

Diesel-powered equipment has been operating in underground mines in Europe since the 1930's. The use of diesel-powered equipment expanded in 1947 when British Coal mines were nationalized. Diesel-powered equipment is used extensively in western European countries, as well as, Canada, Australia, South

Africa and the countries formerly known as the USSR.

In the United States, diesel-powered equipment was first used in 1951. As of 1978, there were about 4,400 diesel-powered units in use in underground U.S. mines, however, a large majority of these units were operating in non-coal mines. Most recent data concerning diesel-powered equipment in underground coal mines is provided by MSHA's Approval and Certification Center (ACC). Based on manufacturing dates of diesel-powered equipment in underground coal mines obtained from the ACC's September 1995 diesel inventory, Table II-2, shows that in almost 45 years the use of diesel-powered equipment in underground coal mines has increased from less than 100 units as of the end of 1975 to 2,349 units as of the end of September of 1995. The ACC's diesel inventory also shows that there are 579 diesel machines that list no manufacturing date, thus, there are actually, 2,928 diesel-powered machines currently in underground coal mines (2,349 + 579 = 2,928).

There are 173 underground coal mines that use diesel-powered equipment, 158 are large mines and 15 are small mines. Underground coal mines that use diesel-powered equipment tend to be large. Only 15 out of 173 (or 8 percent) of the mines which use diesel-powered equipment employ fewer than 20 miners, whereas, 437 out of 1,022 (or 42.8 percent) of all underground coal mines employ fewer than 20 miners. Underground coal mines that use diesel-powered equipment are primarily in Kentucky, Illinois, Utah, Virginia, Colorado and Maryland.

TABLE II-2

NUMBER OF DIESEL-POWERED EQUIPMENT PIECES IN UNDERGROUND COAL MINES IN THE UNITED STATES 1952 THROUGH 9/30/95

Year	Equipment
1952 thru 1975	76
1976	97
1977	141
1978	188
1979	228
1980	303
1981	441
1982	589
1983	652
1984	739
1985	864
1986	1,023
1987	1,151
1988	1,266
1989	1,417
1990	1,609
1991	1,781
1992	1,959
1993	2,103
1994	2,297
9/30/95	2,349
No Date	579

Source: U.S. Department of Labor, Mine Safety and Health Administration. Office of Standards, Regulations, and Variances. 1995.

DEFINITIONS

A definition of terms used throughout this impact analysis is listed below.

Permissible Equipment is a completely assembled machine or accessory for which a formal MSHA approval has been issued. This equipment operates mainly in the part of the underground mine which has a potentially methane rich atmosphere. Such equipment is normally found in the working or production area of the mine. The working area of a mine is defined as the area inby the last open cross-cut. Thus, permissible equipment is also referred to as "inby" equipment.

Nonpermissible Equipment is equipment that does not operate in the part of the mine which has a potentially methane rich atmosphere. Thus, nonpermissible equipment refers to all machines that are not classified as permissible. Nonpermissible equipment is also referred to as "outby" equipment.

Explosion-proof means that a component or subassembly is so constructed and protected by an enclosure and/or flame arrester(s) that if a flammable mixture of gas is ignited within the enclosure it will withstand the resultant pressure without damage to the enclosure and/or flame arrester(s). Also, the enclosure and/or flame arrester(s) shall prevent the discharge of flame or ignition of any flammable mixture that surrounds the enclosure.

Heavy Duty Equipment is mainly production type equipment that is intended to move rock or coal or other heavy loads, such

as, longwall components, as a normal part of their duty cycle. This equipment is also of the type that is used continually during a shift. Although heavy duty equipment can be classified as either permissible or nonpermissible, it is generally permissible equipment.

Light Duty Equipment is equipment that is not intended to move rock or coal, or perform other activities normally associated with production equipment. Although, light duty equipment could carry loads similar to heavy duty equipment, light duty equipment would likely operate infrequently and for short periods of time during the shift. Although light duty equipment can be classified as either permissible or nonpermissible, it is generally nonpermissible equipment.

Permanent Underground Diesel Fuel Storage Facility is a facility designed and constructed to remain at one location for an extended period of time for the storage or dispensing of diesel fuel, and which does not move as mining progresses.

Temporary Underground Diesel Fuel Storage Facility is an area of the mine provided for the short term storage of diesel fuel in a fuel transportation unit and which moves as mining progresses.

Diesel Fuel Transportation Unit is a wheeled vehicle used to transport a diesel fuel tank that can be either self-propelled or not self-propelled.

Nonself-propelled Equipment is equipment that may be moved frequently and is constructed or mounted to facilitate such

movement. This equipment is towed.

Diesel Power Package is a diesel engine and the attached safety components, such as flame arrestor, spark arrestor, surface temperature controls, shut down systems, and exhaust cooling system that make a diesel engine explosion-proof and reduce the engine surface temperatures to safe levels.

PROFILE OF DIESEL-POWERED EQUIPMENT USED IN UNDERGROUND COAL MINES

As seen in Table II-3, of the 2,928 pieces of diesel-powered equipment in use as of the end of September 1995, there are 567 (20 percent) permissible pieces and 2,361 (or 80 percent) nonpermissible pieces. Approximately 98 percent of all diesel-powered equipment is found in large mines. The average small underground coal mine using diesel-powered equipment has about 3 pieces of that equipment, of which 1 is permissible and 2 are nonpermissible. The average large underground coal mine using diesel-powered equipment has about 18 pieces of that equipment, of which 3 are permissible and 15 are nonpermissible.

In general, the types of mining equipment that are diesel-powered and might be found in an underground coal mine, consist of the following types of equipment: air compressor; ambulance; crane truck; ditch digger; foam machine; forklift; generator; gradeR; haul truck; load-haul-dump machine; longwall retriever; locomotive; lube unit; mine sealant machine; personnel car; hydraulic pump machine; rock dusting machine; roof/floor drill; shuttle car; tractor; utility truck; water spray unit and welder.

TABLE II-3

CHARACTERISTICS OF MINES
THAT USED DIESEL-POWERED EQUIPMENT
(AS OF 9/30/95)

Detail	Large	Small	Total
Diesel Equipment			
Permissible	542	25	567
Nonpermissible	2,336	25	2,361
Total	2,878	50	2,928
Average Mine			
Permissible	3	1	
Nonpermissible	15	2	
Total	18	3	

Source: U.S. Department of labor, Mine Safety and Health Adm. Office of Standards, Regulations, and Variances. 1995

The numbers of permissible and nonpermissible diesel-powered equipment by year of manufacture are presented in Table II-4. Of the 2,928 pieces in Table II-4, 80 percent (2,349) of the diesel-powered pieces of equipment have been identified by a manufacturing date; a manufacturing date cannot be associated with 579 pieces. Of the 2,349 pieces, 2,121 (or 90 percent) have been manufactured since 1980. With respect to permissible diesel-powered equipment, 358 of the 462 pieces of diesel-powered equipment for which a date of manufacture is known (or 77 percent) have been manufactured since 1980. With respect to nonpermissible diesel-powered equipment, 1,763 of the 1,887 pieces of equipment for which a date of manufacture is known (or 93 percent) have been manufactured since 1980.

TABLE II-4
PERMISSIBLE AND NONPERMISSIBLE
DIESEL-POWERED EQUIPMENT BY YEAR OF MANUFACTURE (THRU 9/30/95)

Year	Permissible	Nonpermissible	Total
1995	3	49	52
1994	11	183	194
1993	8	136	144
1992	15	163	178
1991	28	144	172
1990	22	170	192
1989	24	127	151
1988	20	95	115
1987	19	109	128
1986	29	130	159
1985	25	100	125
1984	28	59	87
1983	14	49	63
1982	30	118	148
1981	47	91	138
1980	35	40	75
1979	22	18	40
1978	19	28	47
1977	12	32	44
1976	12	9	21
1975	12	13	25
1974	7	9	16
1973	6	4	10
1972	4	0	4
1971	0	1	1
1970	0	3	3
1969	0	1	1
1968	1	1	2
1960	9	2	11
1958	0	1	1
1954	0	1	1
1952	0	1	1
No Date	105	474	579

Source: Dept. of Labor, Mine Safety and Health Administration, Office of Standards, Regulations and Variances. 1995

PART II - REFERENCES

1. Dept. of Energy/Energy Information Agency. DOE/EIA-0584(94). Coal Industry Annual 1994. October 1995.

2. U.S. Department of Labor, Mine Safety and Health Administration. Denver Safety and health Technology Center. Coal 1995 Size-Group Report (Quarters 1 thru 4/Preliminary Data) - CM441, cycle 95/086. Unpublished data. April, 1996.

III. BENEFITS EVALUATION

INTRODUCTION

Fires and explosions are the primary safety hazards associated with the use of diesel-powered equipment in underground coal mines. Diesel-powered equipment, which has an internal combustion engine, increases the potential for fire and explosion when used in the underground coal mining environment, where there are combustibles such as coal dust, and methane. High surface temperatures on diesel-powered equipment can be ignition sources for hydraulic fluid, lubricating oil, diesel fuel, and coal dust. The operation of the engine also presents an ignition source for explosive concentrations of methane that naturally occur and may accumulate in the underground mine environment. Diesel-powered equipment can be large and move very rapidly. In many ways, the operational hazards of diesel-powered equipment are similar to those of electrical-powered equipment.

The handling and storage of diesel fuel underground also present serious fire hazards. Fires can instantaneously occur from the spilling of fuel on hot surfaces or malfunctioning electric components. In addition, any fire in an underground coal mine can rapidly develop into a catastrophic situation if the fire spreads to areas where large quantities of diesel fuel are being stored or to the coal seam. Similar hazards arise from spillage of diesel fuel when it is transported throughout the mine and when diesel machines are refueled. In addition, diesel

fuel can leak from tanks in storage facilities or areas that are damaged or not properly maintained.

Fires and explosions in underground coal mines have resulted in catastrophic loss of life and property. In 1984, a fire in the Wilberg Mine in Utah claimed the lives of 27 miners. In 1989, an explosion at the Pyro Mining Company William Station Mine in Kentucky killed 10 miners. Seventeen miners narrowly escaped a fire in 1990 at the Mathies Mine in Pennsylvania, and 7 miners were injured during fire fighting efforts. In 1992, 8 miners died in an explosion at the Southmountain No. 3 Mine in Virginia. For the period from 1980 through July of 1996, underground coal mine fires and explosions have claimed the lives of 119 miners.

As the consequences of these fires and explosions graphically demonstrate, the underground coal mine environment is conducive to the propagation of any ignition source into a disastrous event.

The 1984 Wilberg Mine fire started with a remote generator which overheated and caught fire. The fire quickly spread to the highly combustible surrounding coal, creating an uncontrollable fire. The fire and lethal products of combustion spread rapidly throughout the mine, trapping and killing 27 miners. The 1989 William Station Mine explosion was found to most likely have been caused by a cutting torch which ignited a body of methane gas that had accumulated in the miners' workplace. The ensuing explosion instantly killed the 10 miners working in the vicinity.

In addition to their victims, fires and explosions in underground coal mines also put many other lives at risk. At such disasters mine rescue teams, typically composed of 7 individuals, make courageous efforts to save the miners', and stabilize the mine sufficiently to recover the victims. In the 1990 Mathies Mine fire, two mine rescue teams were fighting a fire, caused when electrical arcing ignited the surrounding coal. An ignition during these fire fighting efforts injured 7 rescue team members. All together, this coal mine fire endangered the lives of the 17 miners who were trapped, and the 14 mine rescue team members fighting the fire.

The 1992 Southmountain No. 3 Mine explosion likewise endangered numerous mine rescue teams seeking to recover the eight miners killed in an explosion initiated by a cigarette lighter. For more than a week, several times a day, mine rescue teams entered this underground coal mine in attempts to stabilize the conditions sufficiently to recover the miners bodies. Fortunately, there was no further loss of life.

In addition to the legal, medical and other expenses that are incurred, losses from coal mine fires and explosions are also significant. The 1990 Mathies Mine fire resulted in a complete shut down of this operation, which to date has not reopened. At the time of the fire, 408 miners where employed on two coal producing shifts working 5-days a week. Average production was 6,500 tons of coal per day (1.625 million tons annually). At the 1994 price of $19.41 per ton, the lost revenue annually exceeds

$30 million.

Even a non-fatal mine fire at a small operation can have serious financial impact. For example, a 1983 fire on a diesel-powered utility truck at the Emery Mining Corporation's Beehive Mine in Utah rapidly spread throughout the mine. None of the 10 miners working at the mine were killed, but the operation was closed resulting in the loss of $3.1 million in annual coal revenues.

Powered haulage and machinery accidents also significantly contribute to deaths and injuries among miners. In the confined underground coal mine environment, increasingly powerful high-speed diesel-powered equipment can quickly crush and kill or seriously injure miners. This equipment is used to rapidly transport miners and supplies, and power large rock and coal moving machines. A total of 230 deaths in underground coal mines from 1980 through July of 1996 were related to machinery and powered haulage accidents.

Diesel engines also produce harmful exhaust emissions including carbon monoxide, oxides of nitrogen, and particulate matter. The operation of diesel-powered equipment in the underground mine environment creates a workplace with the potential for very high concentrations of these contaminants.

In 1980 there were about 300 pieces of diesel-powered equipment in underground coal mines in the United States. Ten years later, in 1990, some 1,600 units of diesel-powered equipment were in use in underground coal mines and, as of

October 1995, the total rose to 2,900 such machines. Currently, MSHA has very limited regulations which address only in a rudimentary way hazards associated with diesel-powered equipment used in underground coal mines. As the use of diesel-powered equipment continues to increase in underground coal mines, the need to address the specific safety and health hazards associated with such equipment increases.

The Secretary of Labor convened a federal advisory committee in 1988 to evaluate and make recommendations for the safe and healthful use of diesel-powered equipment in underground coal mines. In accordance with the Mine Act, the advisory committee was composed of persons with broad backgrounds and collective expertise in underground mining, diesel equipment, and occupational health and safety. The advisory committee presented a report to the Secretary, which highlighted potential fire hazards associated with the use of diesel-powered equipment, hazards associated with uncontrolled handling and storage of diesel fuel underground, and the acute and long term effects of exposure to diesel exhaust on the health of miners. The advisory committee agreed to a three-fold approach to address hazards associated with diesel-powered equipment: use of MSHA's existing equipment approval process to require that diesel engines be properly designed for use in the underground coal mine environment; rules for the safe use of diesel-powered equipment; and measures to protect the health of miners from the harmful effects of diesel emissions. The advisory committee report

formed the basis of MSHA's proposed rule. The final rule addresses the hazards identified in the advisory committee's report and the proposal, and includes requirements that will reduce those hazards.

SUMMARY OF THE FINAL RULE'S BENEFITS

The final rule establishes comprehensive and integrated requirements governing diesel-powered equipment used in underground coal mines. Compliance with the rule will minimize fire, explosion, fuel handling and storage hazards. The hazards of diesel engine exhaust are addressed by design and performance standards for diesel engines and maintenance. Other safety hazards associated with the use of diesel-powered equipment in underground coal mines are also addressed.

The final rule includes tests and specifications for MSHA approval of diesel engines. The expected benefit of these requirements is clean operating diesel engines appropriate for use in the confined underground mine environment, which will reduce miners' exposure to harmful emissions. The final rule sets test procedures and limits on the concentrations of carbon monoxide, oxides of nitrogen, and establishes the quantity of ventilating air necessary to dilute these exhaust contaminants to safe levels. The rule also contains tests and specifications for diesel engine components, which ensure that diesel engines are fire and explosion-proof.

The final rule also requires diesel-powered equipment to be

equipped with certain basic safety features. The expected benefit of these requirements is reduced fire hazards and lower risk of accidents involving diesel-powered equipment. The final rule requires fire-protection features, including fuel, hydraulic, and electrical system protections; and properly designed, installed and maintained fire suppression systems. Diesel-powered equipment is also required to have basic safety features, such as brakes and lights. In addition, the rule extends to diesel-powered equipment safety measures that have applied to electric-powered equipment and that are proven to protect miners from cave-ins and explosions.

The final rule also addresses diesel-powered equipment when in service underground. The rule provides for a systematic approach to the clean and safe operation of diesel-powered equipment. To accomplish this, the final rule sets standards for ventilation of diesel-powered equipment, routine sampling for toxic exhaust gases in the work place, and the use of low sulfur diesel fuel to minimize emissions, and requires that maintenance be performed by trained personnel to keep diesel equipment in proper operating condition.

To ensure that the hazards associated with diesel fuel usage in the underground mine environment are properly controlled, the final rule includes requirements for the underground storage, transportation and dispensing of diesel fuel. Design, capacity, and dispensing requirements are set for diesel fuel storage, as well as safety precautions and construction requirements for

underground storage facilities and areas, including automatic fire suppression systems. The expected benefit of these rules is the reduction in the risk of fires involving diesel fuel.

The final rule also extends several longstanding safety requirements for electric equipment to diesel-powered equipment. The final rule requires certain diesel equipment to be installed with methane monitors, providing miners with critical protection against methane explosions. The final rule also requires cabs and canopies to be installed on certain diesel-powered equipment, protecting miners from the dangers of roof and rib falls in the underground mine environment.

Below is a more detailed discussion of the specific safety and health hazards of diesel-powered equipment, and the benefits derived from the final rule with respect to those hazards.

SAFETY HAZARDS RELATED TO THE USE OF DIESEL-POWERED EQUIPMENT

FIRES AND EXPLOSIONS ASSOCIATED WITH DIESEL-POWERED EQUIPMENT

Mining experience with diesel-powered equipment has shown that this equipment poses a substantial fire risk. On diesel equipment, the surface temperature of the engine's exhaust components will normally be above the autoignition temperature of combustible materials, particularly the diesel fuel and hydraulic fluid found on the equipment. If these combustible materials contact the hot engine surfaces, they are likely to ignite. Fires and explosions may also be caused by sparks from a diesel engine, or when methane gas is ingested into an engine, resulting

in the ignition of methane in the work place. Diesel-powered equipment presents a different and unique fire risk than other ignition sources in the mining environment. Other types of underground coal mine fires may smolder for some time before a flame develops. However, with many diesel-powered equipment fires open flaming develops very rapidly and is more difficult to extinguish than a smoldering fire.

CHARACTERISTICS OF DIESEL-POWERED EQUIPMENT FIRES IN MINES

MSHA examined 331 diesel-equipment related fires in American mines that occurred between 1970 and February 1992 [1]. The data indicated that: a significant number of fires occurred on mobile diesel-powered equipment in mines; these fires frequently occurred on heavily worked equipment; and the most frequent cause of fire was a fuel source, such as hydraulic fluid or fuel, coming into contact with a hot surface or an electrical ignition source. This information comes from MSHA's accident reports from 1972 through 1991; MSHA coal mine inspector reports for the years 1970 through February 1992; and from "Summary of Underground Diesel Fires" by Pomroy. While many of the fires did not occur in underground coal mines, they involved large diesel-powered equipment presenting similar hazards.

Nearly all of these fires lasted more than 30 minutes (MSHA's Part 50 regulations require only fires of more than 30 minutes to be reported, unless an injury occurred). Of the 331 fires, 151 occurred in metal and nonmetal mines (91 in surface

mines and 60 in underground mines) and 180 occurred in coal mines (170 in surface mines and 10 in underground mines). For much of the period reflected in this data large numbers of diesel-powered equipment were not being operated in underground coal mines. Diesel-powered equipment is used in much greater numbers at surface mines compared to underground coal mines.

Table III-1 shows the cause, ignition source, and fuel source for those fires where such determinations could be made. A cause could be positively determined for 116 of the 331 fires (or 35 percent). In many cases the damage was so severe that the cause of the fire could not be pin-pointed. Concerning these 116 incidents, 46 (or 40 percent) were associated with faults in the vehicle hydraulic systems, 24 (or 21 percent) were associated with faults in the vehicle electrical systems, and 46 (or 40 percent) were due to other causes.

Of the 331 fires, there were 206 (or 62 percent) for which an ignition source was found. With respect to these 206 cases, 131 (or 64 percent) involved a hot surface (e.g., the exhaust manifold, engine, or turbocharger) as the ignition source, 35 (or 17 percent) involved electrical faults, and 40 (or 19 percent) involved other sources.

There were 202 of the 331 cases (or 61 percent) for which the fuel ignited by the ignition source was reported. Concerning these 202 incidents, 131 (or 65 percent) involved either hydraulic fluid or diesel fuel, 27 (or 13 percent) involved oil,

TABLE III-1
FIRES IN AMERICAN MINES

Fires For Which a Cause Could be Determined				
Fires	Hydraulic System Fault	Electrical System Fault	Other Causes	
116	46	24	46	
Fires For Which an Ignition Source Could be Determined				
Fires	Hot Surfaces	Electrical	Other Sources	
206	131	35	40	
Fires For Which a Fuel Source Could be Determined				
Fires	Hydraulic Fluid or Diesel Fuel	Oil, Grease or fuel other than diesel	Insulation or Rubber	Other Substances
202	131	27	10	34

Source: Mine Safety and Health Administration, Approval and Certification Center, Division of Mechanical and Material Safety, Triadelphia, West Va. 26059. 1992. [1].

grease or fuels other than diesel, such as natural gas or propane, 10 (or 5 percent) involved insulation or rubber, and 34 (or 17 percent) involved other substances.

MSHA's examination of the 331 diesel-powered equipment fires in American mines extended to fires that occurred from 1970 to 1992. Since then at least 10 fires, lasting 30 minutes or longer, have occurred on diesel-powered equipment at American mines. A continuing trend is seen in the cause of these fires, mainly leaking hydraulic oil or diesel fuel spraying on hot engine components. Fires due to short circuits in electrical systems also continue.

In addition to the data from American mines, MSHA examined accident reports from the Ministry of Labor, Province of Ontario, Canada, that contain information on diesel-powered equipment fires in Ontario's underground mines. The examination of the Ontario data identified 289 fires on diesel-powered equipment that occurred between the years 1984 through 1992. Approximately 2,600 pieces of diesel-powered equipment are in use in Ontario underground mines, which is the same number in use in American underground coal mines. These mines are of the type that MSHA would classify as metal and nonmetal non-gassy mines. The equipment and machine types involved in the fires are similar to those used in U.S. underground coal mines. Also, fires of any duration (not just greater than 30 minutes) were reported in the Ontario data. The Ontario data confirms the finding in American mines that diesel-powered machines subjected to heavy duty usage

pose significant risk of fire.

Ignition sources identified in the Ontario data were similar to those mentioned in the data noted above: for about 34 percent of the fires (99 fires) the ignition source was attributed to some part of the engine or exhaust system; for 43 percent (123 fires) the ignition source was related to an electrical component; for about 19 percent the ignition source was related to the braking system; and 4 percent (12 fires) had miscellaneous ignition sources.

INJURIES CAUSED BY DIESEL-POWERED EQUIPMENT FIRES

There was an injury in 170 of the 331 cases of fire involving diesel-powered equipment in American mines, and in one case a fatality occurred. Of these 171 cases, 78 were in metal and non-metal mines (65 in surface mines and 13 in underground mines) and 93 were in coal mines (85 in surface mines and 8 in underground mines). Injuries that required days off from work occurred in 123 (or 72 percent) of the 170 cases. In 147 of the 171 cases (or 86 percent) the injuries included an individual being burned and/or being injured in attempting to get off or jump off the machine that was on fire. The final rule sets forth requirements for safety features on certain diesel-powered equipment that would prevent fires. The final rule addresses the ignition and fuel sources that have caused the fires and injuries noted above. Although, many of these fires occurred in underground metal mines rather than coal mines, they are typical

of diesel-powered equipment fires. Injury data was not available with respect to the Canadian fire data.

OTHER TYPES OF SAFETY HAZARDS INVOLVING DIESEL-POWERED EQUIPMENT

Other safety hazards are associated with the use of diesel-powered equipment in addition to fire hazards. The speed and mobility typical of diesel machines can introduce hazards in the underground mine environment. Operating diesel-powered equipment at a high rate of speed coupled with the uneven roadway conditions that are frequently found in many underground mines can cause the operator to lose control of the equipment.

Diesel-powered equipment, like other types of equipment found in underground coal mines, poses safety risks for the equipment operator and the miners who work near the equipment. These hazards include pinch points, runaway hazards from inadequate brakes, and unexpected movement of the machine resulting from unconventional or inadequate controls. These risks are particularly pronounced on diesel-powered mining equipment because of its large size and speed. Safety features that address these hazards are typically found on commercial and industrial type equipment and are applied to diesel-powered mining equipment in this rule.

BENEFITS OF THE RULE CONCERNING SAFETY HAZARDS

The final rule provides safety benefits to miners by addressing the four principal areas of risk resulting from the

introduction of diesel-powered equipment into underground coal mines. These four areas are: fire and explosion hazards of diesel engines, fires due to improper storage and handling of diesel fuel underground, equipment features needed to prevent personnel injury, and maintenance of diesel-powered equipment to assure its continued safe operation. These areas are discussed separately below.

BENEFITS OF THE RULE ADDRESSING DIESEL POWER PACKAGES

Subpart F of the final rule amends existing part 7 and establishes requirements for diesel power packages to assure the safe use of diesel-powered equipment. A diesel power package is a diesel engine and the attached safety components, such as flame arrestor, spark arrestor, surface temperature controls, shut down systems, and exhaust cooling system that make a diesel engine explosion-proof and reduce the engine surface temperatures to safe levels. These requirements benefit miners by reducing the risk of fires and explosions on diesel-powered equipment used in areas of the mine where potentially high concentrations of methane can accumulate. Part 7, and new subpart F, require manufacturer or third-party laboratory testing of diesel-powered equipment for approval in lieu of MSHA testing.

BENEFITS OF THE RULE ADDRESSING FUEL HANDLING AND STORAGE

Sections 75.1902 through 75.1906 set requirements that together comprise a comprehensive approach to addressing the

safety hazards that arise from introducing diesel fuel in underground coal mines. Limitations are set on the amount of fuel that can be stored underground. Also, standards are set for the locations where fuel can be stored; the facilities where fuel can be stored; and the methods of storage, transportation, and dispensing of fuel. The Ontario fire data indicated that 10 fires resulted during the fueling of diesel-powered equipment. These requirements benefit miners by minimizing the risk of accidents during refueling.

In order to protect against diesel fuel spills and unsafe storage practices, § 75.1902 addresses how diesel fuel can be safely stored underground, sets the quantity of fuel that can be safely stored, and specifies safe locations for diesel fuel storage facilities and areas. Section 75.1903 establishes construction and design requirements for diesel fuel storage facilities or areas, including standards for containment in case of a fuel spill. Together, these requirements reduce fire hazards. They will also provide increased protection in the event of a fire through the use of noncombustible construction materials and doors which will close to confine the fire and retard its spread. This section also requires permanent underground diesel fuel storage facilities to be equipped with an automatic fire suppression system. Prohibition against cutting and welding near diesel fuel storage facilities and areas are also set by the final rule.

Section 75.1904 includes standards for the design of diesel

fuel tanks and safety cans to protect against leakage from tanks and their associated components, in order to reduce the risk of fire from spilled fuel, and in case of a fire controlled the release of vapors through emergency venting. Also, tanks and their associated components are required to be protected against the corrosive mine environment and damage from collision by machines running into them in order to avoid the potential fire or explosion hazard that could result from spilled fuel.

Section 75.1905 addresses the inherent risks of spillage and fire when dispensing diesel fuel. These requirements of the final rule address the circumstances under which diesel fuel is dispensed underground, minimizing the occasion for spills. This section also prohibits the use of compressed gas in dispensing diesel fuel, a method that could lead to large amounts of fuel being spilled. Further, diesel machines are prohibited from being refilled with the engine running. The high exhaust component temperatures of operating diesel engines provide an ignition source. This ignition source presents a serious risk during refueling, which can be readily eliminated by shutting off the engine.

One method used to transport diesel fuel underground is through a pipeline from a surface storage facility to an underground location. Such facilities hold as much as 30,000 gallons of diesel fuel. Section 75.1905-1 addresses the hazards of diesel fuel stored in a surface facility that could unintentionally be discharged underground in an uncontrolled

manner. This section sets requirements designed to prevent such a spill, by establishing safety requirements for the piping system, specifications for operating controls, requirements for isolating the piping systems from damage and potential ignition sources, and precautions for containing a unintentional fuel discharge.

Section 75.1906 sets requirements concerning the safe transportation of diesel fuel in order to reduce the risk of fuel spillage and fire underground. The final rule limits the amount of fuel that can be transported in mobile units, and specifies protections for fuel containers during transport. Nonself-propelled diesel fuel transportation units that are equipped with electrical components, such as pumps or lights, present a potential ignition source. Under the final rule, these units must have an automatic fire suppression system capable of responding to a fire, which could involve the diesel fuel. Diesel fuel transportation units are also required to be parked in protected, well ventilated storage facilities and areas when not in use. The final rule places limitations on the use of safety cans containing diesel fuel. These limitations are in response to commenters who were concerned about the uncontrolled use of small quantities of diesel fuel throughout the mine.

Fire suppression systems are necessary in permanent storage facilities because of the large quantity of diesel fuel present and the fire hazards associated with fuel storage and transfer operations. Automatic actuation of these systems is necessary to

extinguish fires that may occur when no miner is in the area. Section 75.1912 establishes standards for fire suppression systems for permanent underground diesel fuel storage facilities. The rule addresses the design, installation, and maintenance of these systems. A properly designed, installed and maintained fire suppression system can extinguish a fire at an early stage of its development when it is easiest to fight.

BENEFITS OF THE RULE ADDRESSING EQUIPMENT SAFETY FEATURES

Equipment safety features are contained in §§ 75.1907 and 75.1909 through 75.1911. Section 75.1907 establishes the basic requirement that only diesel equipment approved under existing regulations may be used in areas where coal is being extracted and where explosive concentrations of methane may exist. Such approved equipment is designed to be explosion-proof and contains basic safety features. This aspect of the final rule consistent with current practices in underground coal mines. It also conforms the safety requirements for diesel-powered equipment with existing safety requirements for electric-powered equipment. Section 75.1907 sets a compliance schedule, ranging from 24 to 36 months, for upgrading the safety features of existing approved diesel-powered equipment, requiring, for example, fire suppression and brake systems.

For equipment that operates in other locations of the mine where methane accumulation is not expected to be a hazard, § 75.1907 sets a 12 to 36 month compliance schedule for

incorporating machine safety features, such as brakes, fire suppression features, electrical system protections, and protections against other fire hazards associated with diesel engines. The compliance schedule set by § 75.1907 provides realistic time frames for incorporating safety features that address the hazards of using diesel-powered equipment.

Section 75.1909 establishes design and performance requirements for safety features on diesel-powered equipment in areas of the mine where coal is not being extracted and explosive levels of methane gas are not expected to accumulate. This section establishes uniform requirements that address common hazards inherent with all types of diesel-powered equipment. In addition, the final rule includes requirements that are tailored to the unique hazards that are associated with different classes of diesel-powered equipment used in underground coal mines. The benefit of this aspect of the rule is to minimize the fire risk associated with diesel-powered equipment by controlling possible fuel and ignition sources. In addition, the final rule requires that other safety features be incorporated on the equipment to address the mobility, speed and size of diesel-powered equipment.

Under § 75.1909 all diesel-powered equipment must have an approved engine. As noted elsewhere, the benefit of this aspect of the final rule is basically clean low emission engines which minimize miner exposure to harmful levels of exhaust gas. In order to address the fire hazard associated with this equipment, all the machines would have to have a substantially constructed

fuel system designed to minimize leaks, the unintentional release of fuel, and be separated from hot surfaces and electrical components that might serve as ignition sources. Similar fire protection is required for hydraulic tanks and lines which could leak and provide fuel for a fire. Guarding to protect the hydraulic, electric and fuel lines, when they pass near rotating parts, is also required. Fires have occurred when fluid from a severed hydraulic or fuel line leaks onto a hot surface of the machine or onto broken electric lines. To further address this hazard, this section contains a requirement that a means be provided to prevent the spray from ruptured hydraulic or lubricating oil lines from contacting hot surfaces. Fires originating in this manner have occurred frequently on diesel-powered equipment used in other mining applications and have produced some of the most serious equipment fires. The expected benefit of these requirements is to minimize the risk of fires by preventing fuel and ignition sources from coming into contact.

While all diesel-powered equipment used in underground coal mines is required to be provided with the features discussed above, other requirements are tailored to specific classes of equipment. The equipment classes are based on how the equipment is used and the fire hazard that the equipment usage presents. For example, automatic fire suppression systems are required on heavy duty equipment, which poses the greatest risk of fire because of its high engine surface temperatures. Nonself-propelled equipment, such as air compressors or electrical

generators, poses a fire risk similar to that of heavy duty equipment and, therefore, is also required to have an automatic fire suppression system. The hot engine surfaces of light-duty equipment still present an ignition source, but the equipment as a whole does not present as great a fire risk as heavy duty equipment. Under the final rule, this equipment can have either a manual or automatic fire suppression system. All diesel-powered equipment must be provided with an appropriate fire extinguisher under the final rule.

Section 75.1909 requires certain safety features to address the hazards associated with the mobility, speed, and size of diesel-powered equipment. The benefit of these requirements is to enable the equipment operator to maintain control of the machine, and avoid injury to the equipment operator and other miners. Section 75.1909 requires diesel-powered machines with steering, brakes, and accelerator pedals to have these controls arranged in the same manner as standard automobile orientation, thus reducing the risk of confusion and loss of vehicle control. Diesel-powered equipment also must be equipped with appropriate service and parking brakes, to provide the equipment operator with adequate stopping ability over the machine and assurance that it will not move if left parked on a grade. The brake system requirements are different for heavy duty and light duty equipment, consistent with the way the equipment is used. Other safety features presently required on electrical equipment, such as lights, reflectors, and audible warning devices, are required

to be installed on diesel-powered equipment.

Also, all diesel equipment is required to be attended when it is operating, because of the inherent fire hazards in the form of fuel and ignition sources. The presence of an operator provides an additional level of safety. The operator can act to correct any problem that develops with the machine, take steps to extinguish a fire in its incipient stages, or warn other miners of a fire.

Section 75.1910 addresses requirements for electrical systems for equipment that operates in locations of the mine where methane accumulation is not a hazard. Electrical systems on this type of equipment have frequently caused fires. The expected benefit of this section is to minimize the risk of electrical system fires by requiring short circuit protection and electrical overload protection, and to protect electrical system components from damage.

Section 75.1911 establishes requirements for fire suppression systems installed on diesel-powered equipment and fuel transportation units. The rule addresses the design, installation and maintenance of fire suppression systems. Properly designed, installed and maintained fire suppression system can extinguish a fire at an early stage of its development when it is easiest to fight.

The final rule also extends several longstanding safety requirements for electric equipment to diesel-powered equipment. The final rule requires methane monitors on diesel-powered

machines used to extract or load coal. Methane monitors, which have been required for many years on certain types of electric equipment, provide an initial warning, then automatically shut down the equipment, when methane concentrations approach explosive levels. This prevents any ignition sources from the machine's operation setting off a potentially catastrophic methane explosion. The final rule ensures that miners working around diesel equipment are protected from fire and explosion hazards to the same extent as miners working around electric equipment.

Methane monitors are a critical line of defense against disaster. In 1981, 15 miners were killed in a methane explosion in an underground coal mine in Colorado when a methane monitor that had not been properly installed failed to shut down the machine lighting circuit. The lighting circuit ignited high levels of methane that had accumulated in the area. Methane monitors on electric equipment have contributed to the reduction in methane and coal dust explosions in underground coal mines over the last 50 years. Between 1947 and 1970 (the year that the Coal Mine Health and Safety Act took effect) 901 miners were killed in methane and coal dust explosions in underground coal mines. Between 1971 and 1994, this number was 133. Methane monitors played a key role in reducing the number of these fatalities.

Under the final rule, certain types of diesel-powered equipment must be equipped with substantially constructed cabs or

canopies to protect miners operating such equipment from roof falls and rib and face rolls. Cabs and canopies, which have been required on certain underground electric equipment since 1972, provide equipment operators with very effective protection from the hazards of roof and rib falls and collisions with the mine roof and ribs. Since 1972, there have been more than 280 documented cases where miners' lives were saved in massive roof falls because they were protected by cabs or canopies. Some mine operators, recognizing the clear safety benefits of cabs and canopies, have already installed them on diesel equipment in their mines. Cab and canopy requirements for diesel equipment will protect equipment operators against very serious hazards in underground coal mines.

BENEFITS OF THE RULE ADDRESSING MAINTENANCE, TRAINING, AND OPERATIONS

The performance of the best designed equipment will deteriorate without proper maintenance. Concern about inadequate maintenance of safety features of diesel-powered equipment was frequently expressed by commenters to this rule. These same commenters stressed the importance of having maintenance performed by fully qualified personnel. Successful programs are in place through existing regulations specifying the required maintenance of electrical equipment. These programs also specify the training and qualification of persons performing maintenance on electric equipment.

Section 75.1914 establishes maintenance requirements for

diesel-powered equipment used in underground coal mines. Inadequate maintenance of diesel-powered equipment can result in the creation of fire or explosion hazards. As part of the maintenance requirements, this section requires that diesel-powered equipment be maintained in safe condition. The expected benefit of this requirement is to minimize the chance for an explosion or fire. The rule also requires that machine operators inspect equipment for safety hazards before placing it in operation. In addition, weekly exams and tests of other features of diesel machines are required. These exams or tests will be conducted by trained personnel in accordance with established maintenance procedures. These measures will ensure that machine defects that could endanger miners are recognized and corrected. These new requirements extend to diesel equipment the same basic maintenance that has been proven successful for electric equipment.

The training of maintenance personnel is an essential part of any effort to control safety hazards associated with diesel machines. Some commenters stated that untrained personnel failed to properly maintain diesel equipment creating hazardous operating conditions. Section 75.1915 contains requirements for the comprehensive training and qualification of persons who maintain and repair diesel-powered equipment. The expected benefit of requiring adequate training of persons performing maintenance is an increased assurance that safety and health hazards are recognized and that repair work is performed

correctly.

Starting aids, such as ether in aerosol cans are used in cold weather to help start diesel engines. Section 75.1913 establishes requirements for the proper use and storage of starting aids. The expected benefit of this section is to prevent improper use of starting aids which could create a flashback of fire that can ignite a flammable mixture of methane in the air.

Much of the diesel-powered equipment in use in underground coal mines is the same type used in over-the-road or industrial applications. This equipment can travel at much higher speeds than electrical equipment designed specifically for underground mining. Unlike electrical equipment, diesel-powered equipment does not need to be connected to the mine electrical system with a power cable. Section 75.1916 addresses the hazards associated with the increased speed and mobility of diesel machines by requiring that operating speeds be consistent with visibility and condition of roadways, roadways be kept in good condition, and that traffic rules be standardized at each mine.

HEALTH HAZARDS RELATED TO THE USE OF DIESEL-POWERED EQUIPMENT

Underground mining creates confined areas where supplying healthful air for miners to breath is a major concern. The health of miners in the confined area of underground mines is affected by toxic gases and dust that may be present. Diesel engines used in underground mines emit toxic gases and

particulate matter in their exhaust. If these pollutants are not controlled, the operation of diesel engines in underground coal mines can result in the overexposure of miners to toxic substances recognized as harmful and which can produce long term adverse health effects.

EXPOSURE TO GASEOUS CONTAMINANTS IN DIESEL EXHAUST

Diesel engines, like all internal combustion engines, produce large quantities of exhaust gas. A portion of this exhaust gas consist of harmful gases and particulate matter. The harmful gases consist mostly of carbon monoxide and the oxides of nitrogen. Other harmful gases, such as sulfur dioxide, are present in smaller amounts. The toxic nature of these gases is recognized and the levels to which workers can be exposed without harmful effects have been established by various health organizations. The American Council of Governmental Industrial Hygienists (ACGIH) sets exposure levels for many gases and other substances found in work places. MSHA has adopted into its regulations many of the exposure levels established by the ACGIH for gases found in mine environment.

MSHA already has regulations in place that limit miner exposure to carbon monoxide, the oxides of nitrogen and other gases found in diesel exhaust, because these gases can be liberated from other sources. For example, carbon monoxide is produced by the decomposition of mining timbers, the oxides of nitrogen are produced by the detonation of explosives used in

mining, and sulfur dioxide is produced by naturally occurring sulfur in the coal. However, miners must be protected from exposure to harmful levels of these gases when produced by diesel engines.

Diesel engines do not produce the same quantities of toxic gases under all conditions of operation. When diesel engines work hard producing higher horsepower, they burn more fuel, produce more exhaust gas, and that exhaust gas contains higher levels of toxic gases. In the mining environment, ventilating air dilutes these gases to acceptable levels and carries away the toxic gases. Consequently, the most hazardous conditions occur when multiple diesel engines are operated at high power levels in areas of restricted ventilation.

The most common complaints of miners involve unloading diesel-powered coal haulage equipment and installing and removing extremely heavy mining equipment. These operations are typically carried out with several diesel-powered machines operating simultaneously at high engine power levels in concentrated areas. These complaints have been borne out through MSHA field studies that have identified levels of carbon monoxide and the oxides of nitrogen that are above the acceptable levels.

The complete record of the diesel rulemaking incudes numerous references to serious health hazards from exposure to diesel exhaust. The Advisory Committee report referenced the Committee's discussions and miners' panel presentations related to health effects other than respiratory diseases. Several

studies were discussed which showed increased symptoms related to diesel exposure. These include dizziness, eye and olfactory irritation, nausea, drowsiness, headaches, skin rashes and other problems. While these effects may be difficult to measure, there is repeated testimony from miners at both the advisory committee meetings and the diesel public hearings concerning theses adverse health effects. Individual miners testified, many of whom stating that they required medical treatment.

Miners at the public hearing reiterated both the acute and chronic effects of exposure to diesel exhaust. The incidence of acute effects, e.g. eye, nose and throat irritations, according to miners reports, are difficult to measure under current MSHA illness reporting regulations. Obviously, chronic effects are more dependent upon long-term studies. There were two medical doctors on the advisory committee, including the chairman. They stated that "it was uncertain what the long term effects of repeated headaches, nausea, or conjunctivitis are, but such effects would affect the overall health of workers." (Adv. Comm., report, p. 70).

EXPOSURE TO PARTICULATE MATTER IN DIESEL EXHAUST

In addition to producing harmful exhaust gases, diesel engines produce large quantities of particulate matter, which appear as smoke. Diesel particulate matter is a complex mixture of solid materials formed during the combustion process, which are small enough to be breathed deep into the lungs. Although

extensive research has been conducted into the adverse health effects of exposure to diesel particulate matter, the scientific community has not yet reached a consensus on the level of particulate matter to which miners can be exposed without adverse health effects. In their report, the Secretary's Diesel Advisory Committee noted that diesel exhaust, including its particulate matter, presented a health hazard to humans. While proposing no specific exposure level, the Advisory Committee recommended control of diesel particulate underground through a combination of measures.

BENEFITS OF THE RULE CONCERNING HEALTH HAZARDS

The final rule provides health benefits to miners by requiring action in four major areas to limit miner exposure to gaseous and particulate emissions from diesel engines. The final rule would require that only clean burning engines using low sulfur diesel fuel be used in mines to minimize emissions, that adequate ventilation be provided in areas where diesel equipment is being used, that sampling be conducted to confirm that miners are not being exposed to harmful emissions, and that proper engine maintenance be performed by qualified persons. The rule integrates requirements in these four areas to provide the required level of health protection without making any single requirement overly burdensome.

BENEFITS OF THE RULE ADDRESSING APPROVED DIESEL ENGINES AND LOW SULFUR FUEL

For underground coal mines, clean burning engines are critically important. Unlike electrically powered equipment, diesel engines emit exhaust containing toxic gases that can be harmful to miners. Inappropriately designed engines can pollute the mine atmosphere excessively, elevating toxic gases to levels that can not be controlled with normal ventilation practices. To achieve the objective of clean burning, appropriately designed engines part 7, subpart E, sets performance standards and testing requirements for all engines used in underground coal mines. The expected benefit of this rule is a limit on the amounts of harmful gases which are produced and the determination of the quantity of ventilating air required to dilute these gases to safe levels. The testing also determines the amount of diesel particulate in the exhaust, allowing the cleanest engines to be selected for use in underground coal mines. Manufacturer or third party laboratory testing is required for approval of diesel engines in lieu of MSHA testing.

The amount of sulfur in the fuel is related to the amount of gaseous and particulate emissions produced by the engine. Section 75.1901 requires the use of the same low sulfur diesel fuel which is used by all highway trucks. The use of low sulfur fuel provides the benefit of immediately reducing emissions from diesel engines, and also promotes the use of exhaust aftertreatment technologies which can further reduce emissions.

BENEFITS OF THE RULE ADDRESSING VENTILATION

Adequate ventilation must be provided in areas of underground coal mines where diesel-powered equipment is being used to protect miners from exposure to harmful levels of exhaust contaminants. Using the minimum ventilating air requirements established for diesel engines in part 7, subpart E, a mine operator can operate diesel-powered equipment while protecting the health of miners. Sections 75.325(f) through (j) establish the quantity of ventilating air that must be provided to control exhaust contaminants from individual and multiple diesel engines to allowable exposure levels.

MSHA conducted a study of three coal mines that use diesel equipment, two in the West and one in the East, to determine representative levels of gaseous diesel exhaust emissions [2]. Although all of these mines used relatively large quantities of ventilating air, the study nonetheless found concentrations approaching ceiling values of nitrogen dioxide and carbon monoxide over the threshold limit values at various locations in the mines. This demonstrates that the air used to ventilate the mine must be distributed effectively to dilute harmful gaseous diesel exhaust contaminants. The final rule addresses this by specifying locations where a minimum air quantity must be maintained to control air quality in areas of the mine where high concentrations of exhaust gas occur. The most common miner complaints involve the build up of diesel exhaust emissions while unloading diesel-powered coal haulage equipment and installing

and removing extremely heavy mining equipment. These operations are typically carried out with several diesel-powered machines operating simultaneously in areas of restricted ventilation. An expected benefit of the rule is to provide sufficient ventilating air at these locations to dilute exhaust gases to allowable levels.

The particulate produced by diesel engines is currently controlled under existing health standards limiting the amount of dust that can be in the underground coal mine atmosphere. The mine operator can use the particulate data, obtained during part 7, subpart E, engine approval, to estimate the contribution of the diesel particulate to the total mine dust level.

BENEFITS OF THE RULE ADDRESSING SAMPLING

The effectiveness of the mine operator’s efforts to limit exposure of miners to the contaminants from diesel exhaust can only be evaluated by sampling the mine environment for those contaminants. Although the integrated approach of using clean burning engines and low sulfur diesel fuel to minimize emissions, providing adequate ventilation in areas where diesel equipment is being used, and performing proper engine maintenance by qualified persons is expected to maintain diesel exhaust emissions to acceptable levels, sampling must be used to confirm that miners are not being exposed to harmful emissions. The MSHA study of three coal mines supports this conclusion. This approach is needed because of frequent changes in mining conditions and

variability in diesel equipment usage.

Section 70.1900 requires sampling for carbon monoxide and nitrogen dioxide at specific locations. Measurement at these locations provides the most accurate appraisal of the effectiveness of the integrated approach to controlling miner exposure to harmful emissions. Sampling is required to be performed at a time when emission levels are representative of the contribution of all equipment during normal operations and the results of sampling are available immediately to the person performing the sampling. Finally, § 70.1900(c) requires prompt corrective action, such as increased ventilation or servicing of equipment, to be taken. The expected benefit of this regulation is increased assurance that miners will not be exposed to harmful levels of diesel exhaust gas.

BENEFITS OF THE RULE ADDRESSING MAINTENANCE AND TRAINING

Diesel engine performance deteriorates with usage. Engine faults such as malfunctioning fuel injectors or dirty air filters can develop. These faults can increase the levels of harmful exhaust emissions produced by the engine. Section 75.1914 requires that diesel engines be properly maintained so that they continue to operate as clean burning engines. Additionally, weekly testing of exhaust levels of carbon monoxide required by this section will provide an indication of a problem developing with the engine and identify the need for corrective action.

The training of maintenance personnel is an essential part

of any effort to control the health hazards associated with diesel engines. Some commenters stated that untrained personnel failed to properly maintain diesel engines. Section 75.1915 contains requirements for the comprehensive training and qualification of persons who maintain diesel engines. Taken together, the expected benefit of requiring that diesel engines be properly maintained by trained and qualified persons is an increased assurance that diesel engines continue to operate as clean burning engines and that miners will not be exposed to harmful levels of diesel exhaust gases.

ADDITIONAL BENEFITS OF THE RULE

Currently, MSHA regulates the use of diesel-powered equipment underground through the ventilation plan approval process and some general machine use requirements in existing regulations for underground coal mines. Some states also have regulations which either comprehensively or partially address hazards associated with the use of diesel equipment underground. Other states prohibit the use of diesel-powered equipment in underground coal mines. The final rule, will provide the benefit of uniform regulations that are specifically applicable to the use of diesel-powered equipment in underground coal mines. These uniform regulations will encourage an equitable regulatory playing field for mine operators, miners, engine and machine manufacturers, and coal producing states.

The rule allows engine and equipment manufacturers to test

diesel engines and power packages for conformance to approval standards instead of the current practice of MSHA performing all testing. Engine and equipment manufacturers will benefit by gaining the flexibility to determine the most timely and economical means to have the testing completed. The rule also incorporates internationally accepted engine testing procedures. This will enable diesel engine manufacturers to test with a single set of procedures common to both the United States and foreign markets. The use of the international test procedures provides a more competitive posture for American products in foreign markets, leads to increased compatibility with international testing practices, and stimulates metric conversion.

Further, the final rule will eliminate outdated regulations in Part 31 "Diesel Mine Locomotives" and Part 32 "Mobile Diesel-powered Equipment for Noncoal Mines". Part 31 was promulgated in 1944 and has not been updated. Its requirements are inconsistent with a number of existing MSHA standards. Approvals of locomotives is used areas of the mine where permissible electrical equipment is required and have been effectively granted through the use of the Part 36 equipment approval program. Part 32 specifies requirements for approval of diesel-powered equipment but there is no existing MSHA regulation that requires the use of Part 32 approved equipment.

PART III - REFERENCES

1. Dept. of Labor/Mine Safety and Health Administration, Approval and Certification Center. Division of Mechanical and Material Safety. Triadelphia, West Va. 26059. April 1992.

2. Mine Safety and Health Administration, Pittsburgh Health Technology Center, Investigation Reports P221-V127 (1982), P199-V105 (1981), and P206-V112 (1981).

IV. COST OF COMPLIANCE

INTRODUCTION

This chapter contains MSHA's estimates of the compliance costs associated with the final rule. The baseline for these estimated costs is current industry practices. As the rule will impose compliance costs upon both underground coal mines and diesel-powered equipment manufacturers, this analysis contains separate estimates for each of these groups. In addition, the compliance costs incurred by underground coal mines using diesel-powered equipment are differentiated into those compliance costs incurred by large coal mines and those compliance costs incurred by small coal mines.

METHODOLOGY

MSHA estimated compliance costs with the rule on a provision by provision basis, using the baseline of current industry practices. These estimated costs are the incremental (i.e., additional) costs that underground coal mine operators of diesel-powered equipment and diesel-powered equipment manufacturers will incur for compliance. Many provisions of these rules, such as approved engines and other components required for permissible diesel-powered equipment have been required by MSHA through the mine ventilation plan approval requirements. Consequently, many provisions will involve no compliance costs because underground coal mines are currently in compliance.

DATA BASES

The cost of compliance estimates are based upon several data sources. One source is the opinions, facts, and policies provided by MSHA District Office and MSHA Approval and Certification Center (ACC) personnel. Their experiences with and knowledge of underground coal mines and diesel-powered equipment provide an appropriate basis for determining current industry practices, the extent to which these practices would need to be modified for compliance with the final rules, and the cost of these modifications. Another source is public comments in response to MSHA's proposed rule. A third source is cost information directly obtained from manufacturers and distributors of diesel-powered equipment by the Office of Standards, Regulations, and Variances.

The labor costs are primarily based upon the 1994 wage rate of $18.64 an hour for coal miners reported in March 1995 by the Bureau of Labor Statistics [1, p. 97]. This rate was raised by 40 percent [2, pp. La19] to account for such fringe benefits as workers compensation, unemployment insurance, social security, medical and others. As a result, total hourly compensation is about $26. The 1993 weighted average hourly earnings for supervisory salaried engineers is $26.68 [3, p 9]. Raising this hourly wage rate by 40 percent to account for fringe benefits [4, p 3] results in a total hourly compensation of $37.35. In order to convert capital costs into annualized capital costs, a 7 percent discount rate is used.

TYPES OF COSTS

MSHA estimated: (1) Initial costs; (2) annualized costs (which are Initial costs amortized over a specific number of years); and (3) annual costs.

Initial costs consist of capital expenditures and one time costs. Capital expenditures are defined as equipment purchase costs. One time costs are costs, other than equipment costs, that are usually incurred once and do not reoccur annually. An example of a one time cost would be the costs to develop a written procedural program.

Initial costs are amortized over a specific number of years to arrive at what is called annualized costs. Initial costs are annualized in order to recognize that equipment is used over a period of years, or that a plan or program developed in one year will be used for several years. Converting an initial cost to an annualized cost changes that cost from one that does not reoccur annually to one that does reoccur annually. This conversion is done so that the annualized costs (which are converted initial costs) can be added to annual costs in order to get the cost per year of a rule that accounts for all of the costs in that rule. Annual costs are costs that normally reoccur annually. Examples of an annual cost are maintenance costs and recordkeeping costs.

SUMMARY OF COST OF COMPLIANCE ESTIMATES

The total compliance costs of the rule is estimated to be

about $10.35 million per year, of which mine operators will incur about $10.3 million per year and manufacturers will incur about $50,450 per year.

Compliance Costs for Mine Operators

The $10.3 million consist of annualized cost plus annual costs. Initial costs were estimated to be $24.0 million. The $24.0 million were amortized over a specific period of time to arrive at $4.9 million of annualized costs. The $4.9 million of annualized costs were then added to $5.4 million of annual costs to arrive at $10.3 million per year.

Of the $10.3 million, large mines will incur about $10.1 million. Initial costs for large mines were estimated to be $23.5 million which were amortized over a specific period of time to be $4.8 million. The $4.8 million were then added to $5.3 million of annual costs to arrive at $10.1 million per year.

Of the $10.3 million, small mines will incur about $210,800. Initial costs for small mines were estimated to be $546,700 which were amortized over a specific period of time to be $92,300. The $92,300 were then added to $118,500 of annual costs to arrive at $210,800 per year.

Compliance Costs for Manufacturers

Of the $10.35 million, manufacturers will incur about $50,450. Initial costs for manufacturers were estimated to be $226,800 which were amortized over a specific period of time to be

$15,900. The $15,900 were then added to $34,550 of annual costs to arrive at $50,450 per year.

Table IV-1 summarizes estimated costs by section for large and small mines; and Table IV-2 summarizes estimated costs by section for manufacturers.

TABLE IV - 1:
UNDERGROUND COAL MINE COMPLIANCE COSTS FOR DIESEL EQUIPMENT (DOLLARS X 1,000)

Standard or Subpart	Large and Small Mines			Large Mines			Small Mines		
	(A) Total [Col. B+C]	(B) Annualized	(C) Annual	(D) Total [Col. E+F]	(E) Annualized	(F) Annual	(G) Total [Col. H+I]	(H) Annualized	(I) Annual
P-70.1900	($ 59.7)	$ 80.9	($ 140.6)	($ 77.7)	$ 75.8	($ 153.5)	$ 18.0	$ 5.1	$ 12.9
P-75.325	$ 589.0	$ 0	$ 589.0	$ 589.0	$ 0	$ 589.0	$ 0	$ 0	$ 0
75.1902	$ 39.7	$ 39.7	$ 0	$ 37.6	$ 37.6	$ 0	$ 2.1	$ 2.1	$ 0
75.1903	$ 68.5	$ 51.5	$ 17.0	$ 58.2	$ 44.7	$ 13.5	$ 10.3	$ 6.8	$ 3.5
75.1904	$ 32.7	$ 32.7	$ 0	$ 31.2	$ 31.2	$ 0	$ 1.5	$ 1.5	$ 0
75.1905	$ 2.4	$ 2.4	$ 0	$ 2.3	$ 2.3	$ 0	$ 0.1	$ 0.1	$ 0
75.1906	$ 251.8	$ 173.5	$ 78.3	$ 244.7	$ 168.8	$ 75.9	$ 7.1	$ 4.7	$ 2.4
75.1907	$ 1,610.3	$ 1,596.6	$ 13.7	$ 1,589.6	$ 1,576.4	$ 13.2	$ 20.7	$ 20.2	$ 0.5
75.1909	$ 3,028.0	$ 2,532.9	$ 495.1	$ 2,971.2	$ 2,487.6	$ 483.6	$ 56.8	$ 45.3	$ 11.5
75.1910	$ 117.4	$ 117.4	$ 0	$ 116.1	$ 116.1	$ 0	$ 1.3	$ 1.3	$ 0
75.1911	$ 1,221.3	$ 0	$ 1,221.3	$ 1,203.2	$ 0	$ 1,203.2	$ 18.1	$ 0	$ 18.1
75.1912	$ 20.0	$ 0	$ 20.0	$ 16.5	$ 0	$ 16.5	$ 3.5	$ 0	$ 3.5
75.1913	$ 9.5	$ 9.5	$ 0	$ 9.4	$ 9.4	$ 0	$ 0.1	$ 0.1	$ 0
75.1914	$ 2,769.3	$ 40.1	$ 2,729.2	$ 2,700.0	$ 36.8	$ 2,663.2	$ 69.3	$ 3.3	$ 66.0
75.1915	$ 573.9	$ 155.4	$ 418.5	$ 572.3	$ 153.9	$ 418.4	$ 1.6	$ 1.5	$ 0.1
75.1916	$ 8.7	$ 8.7	$ 0	$ 8.4	$ 8.4	$ 0	$ 0.3	$ 0.3	$ 0
Total	$ 10,282.8	$ 4,841.3	$ 5,441.5	$ 10,072.0	$ 4,749.0	$ 5,323.0	$ 210.8	$ 92.3	$ 118.5

TABLE IV-1
(Continued)

Source: U.S. Dept. Of Labor, Mines Safety and Health Adm., Office of Standards, Regulations, and Variances. 1995

TABLE IV-2
ESTIMATED MANUFACTURERS COMPLIANCE COSTS
ASSOCIATED WITH THE REGULATIONS FOR DIESEL-POWERED EQUIPMENT
IN UNDERGROUND COAL MINES

Standard	Manufacturers Costs		
	(A) Total [Col. B+C]	(B) Annualized	(C) Annual
Part 7 - Subpart E	$42,650	$12,200	30,450
Part 7 - Subpart F	$7,800	$3,700	$4,100
Total Part 7	$50,450	$15,900	$34,550

Source: U.S. Depart. of Labor, Mine Safety and Health Adm., Office of Standards, Regulations, and Variances. 1995

PART 7 - SUBPART E

DIESEL ENGINES INTENDED FOR USE IN UNDERGROUND COAL MINES

Introduction and Summary

Part 7, subpart E, establishes requirements for MSHA approval of diesel engines intended for use in areas of underground coal mines where permissible electrical equipment is required. It also establishes requirements for approval of diesel engines intended for use in an underground coal mine in areas where nonpermissible electrical equipment is allowed. The compliance costs in part 7, subpart E, are initially incurred by manufacturers.

The total first year costs for part 7, subpart E, will be $174,000, all of which are related to existing nonpermissible engine models. The total annualized costs, which are also related solely to existing nonpermissible engine models is $12,200. The total annual costs are $30,450, of which $24,400 are related to new nonpermissible engine models and $6,050 are related to new permissible engine models. With respect to part 7, subpart E, the majority of the compliance costs are related to tests for a maximum fuel air ratio, a gaseous ventilation rate, and a particulate index. Whether one or all of these tests are needed depends on the circumstances which are explained below in the discussion of permissible and nonpermissible engines. New Application filing costs are minimal unless otherwise noted below.

Permissible Engines

Currently, manufacturers receive MSHA approval for new permissible engine models under existing Part 36 regulations. As part of this approval process a maximum fuel air ratio test and gaseous ventilation test on new permissible engine models is performed. Under this rule, manufacturers seeking certification of new permissible engine models will now seek approval under part 7, subpart E, rather than under Part 36. The tests required under existing Part 36 for new permissible engine models are also required under part 7, subpart E. The costs now incurred under part 36 to run the maximum fuel air ratio test and the gaseous ventilation test are approximately $10,000, which includes $6,000 in engine set up costs and $4,000 to run the maximum fuel air ratio test and gaseous ventilation test. Thus, there are no additional costs associated with either a maximum fuel air ratio test or gaseous ventilation test required by part 7, subpart E.

However, under part 7, subpart E an additional test is required to determine a particulate index number for each new permissible engine model. There will be compliance costs to manufacturers associated with the particulate index test because under part 36 such a test is not required. Since $6,000 of engine set up costs is currently incurred under part 36 to run the maximum fuel air ratio test and/or the gaseous ventilation test on new permissible engine models, then no additional engine set up costs are incurred to run the particulate index test. MSHA estimates that to run a particulate index test for each new

permissible engine model will cost $4,000. Also, MSHA estimates that manufacturers will seek part 7, subpart E, certification of between 1 to 2 new permissible engine models annually, or on average 1.5 engine models. Manufacturers annual costs concerning a particulate index test for new permissible engine models approved under part 7, subpart E, will be about $6,000 [$4,000 x 1.5]. Compliance costs concerning the computation of a particulate index for existing permissible engine models is discussed in § 75.1907(b)(3).

Nonpermissible Engines That Currently Have Part 32 Approval

Currently, manufacturers receive MSHA approval for nonpermissible engine models under existing part 32 regulations. As part of this approval process a maximum fuel air ratio test and gaseous ventilation test on nonpermissible engine models is performed. Under the final rule, manufacturers requesting certification of new nonpermissible engine models will seek approval under part 7, subpart E, rather than under part 32. This rule will eliminate part 32 regulations. The tests required under part 32 for new nonpermissible engine models are also required under part 7, subpart E. Thus, there are no additional costs associated with either a maximum fuel air ratio test or gaseous ventilation test required by part 7,subpart E.

However, under part 7, subpart E, an additional test is required to determine a particulate index number for existing and new nonpermissible engine models. There will be compliance costs

to manufacturers associated with the particulate index test because under part 32 such a test is not required. MSHA estimates that manufacturers will seek a one time part 7, subpart E, certification of 16 existing nonpermissible engine models that currently have part 32 approvals. These 16 engine models will each require a one time test to determine a particulate index. Since these 16 existing nonpermissible engine models had the maximum fuel air ratio test and gaseous ventilation test when they were approved, the engine set up costs will be necessary when running the particulate index test. MSHA estimates that the cost to run a particulate index test is about $10,000, which consist of $6,000 of engine set up costs and $4,000 to run the particulate index test. The first year costs for a particulate index test for 16 existing nonpermissible engine models will be $160,000 [$10,000 x 16]. This one time cost of $160,000 was annualized at a rate of 7 percent to be about $11,200. With respect to new nonpermissible engine models, MSHA estimates that manufacturers will seek part 7, subpart E, certification of between 2 to 3 models annually (for an average of 2.5). There will be 2.5 new nonpermissible engine models annually that will require a particulate index test. New nonpermissible engine models are already required and would be set up to run a maximum fuel air ratio test and a gaseous ventilation test; there will be no additional engine set up costs to run a particulate index test. The costs to run a particulate index test on each new nonpermissible engine model will be

$4,000. The annual costs concerning this test for new nonpermissible engine models that would have received approval under part 32 will be $10,000 [2.5 x $4,000].

Nonpermissible Engines Without Part 32 Approval

Currently, there are nonpermissible engine models that are not approved under part 32 but are present in underground coal mining. MSHA estimates that manufacturers will seek part 7, subpart E, certification of 1 such existing nonpermissible engine model. Although there are currently more than 1 existing nonpermissible engine model that is not approved under part 32, MSHA believes that manufacturers will only seek part 7, subpart E, certification for 1 such model. Other existing models are older and do not give as favorable ventilation numbers in test results as newer models. The 1 existing nonpermissible engine model will incur a one time cost for tests to determine numbers for a maximum fuel air ratio, a gaseous ventilation rate, and a particulate index. Since the engine set up procedures to conduct all three tests overlap the tests can be run simultaneously once the engine is set up. MSHA estimates that the cost to conduct all three tests will be about $14,000. This includes $6,000 in engine set up costs, $4,000 to run the maximum fuel air ratio and gaseous ventilation tests, and $4,000 to run the particulate index test. Thus, the one time costs related to all three tests for 1 existing nonpermissible engine model that is not currently approved under part 32 will be $14,000 [$14,000

x 1]. This $14,000 was annualized at 7 percent to be about $1,000. It is estimated to take 34.5 hours to prepare and submit an application at a rate of $75 per hour. Application costs are $2,600 (1 x 34.5 hrs. x $75).

Further, manufacturers currently produce 2 new nonpermissible engine models yearly which would not have part 32 approval. Under the rule, manufacturers will now have to request approval under part 7, subpart E, for such engines. MSHA estimates that manufacturers will seek part 7, subpart E, certification annually for only 1 new nonpermissible model that would have lacked part 32 approval. The costs are the same as above except for the fact that they will occur annually. Thus, the annual costs will be $14,000 [$14,000 x 1].

With respect to testing to determine a particulate index, it should be noted that some engine manufacturers may have the equipment and conduct a particulate index test to meet the U. S. Environmental Protection Agency (EPA) and the state of California requirements for diesel engines used in off highway applications. To the extent that the test results can be used to meet MSHA requirements, then diesel engine manufacturers costs will be less.

Section By Section Analysis

Section 7.81 - Purpose and Effective Date

This section states that part 7, subpart E establishes the specific engine performance and exhaust emission requirements for

MSHA approval of permissible (category A) and nonpermissible (category B) diesel engines. It also sets forth effective dates for part 7, subpart E. There are no compliance costs associated with § 7.81.

MSHA will permit engine testing to be performed at an Applicant or third party testing laboratories and, at this time, it is MSHA's intent to witness all such tests. The costs to the manufacturer will not significantly change as a result of MSHA's intent to witness engine testing. Currently, engines are tested at MSHA's facilities and the manufacturers' are charged for such testing. In addition, the manufacturer will generally send a company person to MSHA to answer questions that may arise during testing. If testing is done by the manufacturer or third party, an MSHA person will travel to the manufacturer laboratory at the manufacturers expense, in lieu of travel by a company person to MSHA's testing facilities, and thus the manufacturer will incur about the same costs as he did before the rule.

With respect to the costs to conduct the particulate index test, MSHA does not currently perform this test. The costs to manufacturers to conduct a particulate index test was discussed earlier in this section. Engine manufacturers and third party testing facilities are familiar with test procedures for diesel particulate and the majority of the engine manufacturers and third party test facilities currently have the capability to perform such tests in their laboratories. The costs of the tests conducted by MSHA are similar to that charged by the private

sector. Thus, MSHA does not expect costs for testing under subpart E to increase significantly.

Section 7.82 - Definitions

This section establishes definitions related to part 7, subpart E. There are no compliance costs associated with this section.

Section 7.83 - Application Requirements

This section requires that applications for a diesel engine approval include such items as the engine specifications, drawings specifying all details affecting the technical requirements of this subpart, an engine general arrangement drawing, composite drawings, etc. The requirements are similar to existing 30 CFR § 36.6 and manufacturers already provide this material to MSHA for engines.

Section 7.83(f) requires that after testing has been completed the manufacturer submit certain test result numbers concerning the rated speed and horsepower. These are: (1) the gaseous ventilation rate; (2) the particulate index; (3) and a fuel deration chart for altitudes. The computation of the compliance costs for the first two items was considered earlier in the discussion of permissible and nonpermissible engines. The manufacturers currently supply the third item to MSHA.

Section 7.84 - Technical Requirements

The technical requirements for approval of diesel engines in areas of underground mines where permissible and nonpermissible equipment is required are based on the applicable sections in part 36 and 32. Many requirements of §7.84 are already met by existing permissible and nonpermissible diesel engines with part 32 approval. For those nonpermissible engine models without part 32 approval, applicable compliance costs were determined earlier in the discussion of nonpermissible engines.

Section 7.84(a) requires that the fuel injection system of a diesel engine control the rate and quantity of liquid fuel supplied to the combustion chamber. As this standard is similar to existing § 36.22 for permissible equipment and § 32.4(c) for nonpermissible equipment that have part 32 approval, manufacturers are in compliance and there are no associated compliance costs for either permissible engines or nonpermissible engines that have part 32 approval. For those nonpermissible engine models without part 32 approval, any applicable compliance costs were discussed earlier in the discussion of nonpermissible engines.

Section 7.84(b) requires that the quantity of carbon monoxide (CO) and oxides of nitrogen (NO_x) being generated in the combustion process be limited to a specified concentration in the undiluted raw exhaust. This provision was derived from § 36.26(b) with respect to permissible engines and is similar to § 32.4(f)(1) concerning nonpermissible engines that have part 32

approval. Manufacturers are in compliance and there will not be any compliance costs for permissible engines or nonpermissible engines that have part 32 approval. For those nonpermissible engine models without part 32 approval, any applicable compliance costs were determined earlier in the discussion of nonpermissible engines.

Section 7.84(c) requires that a gaseous ventilation rate be established for each requested rated speed and horsepower as determined by tests described in § 7.88(b). This provision was derived from § 36.45 for permissible engines and is similar to § 32.5(a)(2) for nonpermissible engines that have part 32 approval. Manufacturers are in compliance and there will not be any compliance costs for permissible engines or nonpermissible engines that have part 32 approval. For the nonpermissible engine models without part 32 approval, any applicable compliance costs were determined earlier in the discussion of nonpermissible engines.

Section 7.84(d) requires that fuel rates specified in the fuel deration chart be based on tests conducted under (b) and (c). As this standard is similar to § 36.44(c) for permissible engines and § 32.5(a)(3)(iii) for nonpermissible engines that have part 32 approval, manufacturers are in compliance for permissible and nonpermissible engines. For those nonpermissible engine models without part 32 approval, any applicable compliance costs were computed earlier in the discussion of nonpermissible engines.

Section 7.84(e) requires that a particulate index be established for each requested rated speed and horsepower as determined by tests described in § 7.89. This provision is new and manufacturers have not typically provided this information to MSHA. Once a specific engine model is tested and approved, all engines of the same model will be considered as being in compliance with this provision. The compliance costs to determine a particulate index for engine models was computed earlier in the discussion of permissible and nonpermissible engines.

Section 7.85 - Critical Characteristics

The two critical characteristics of a diesel engine covered in this section are: (1) setting the fuel rate to altitude and; (2) having a sealed fuel injection pump adjustment. This section requires that these critical characteristics be inspected or tested on each diesel engine to ensure that performance and emission characteristics of production engines are equivalent to the tested engine.

The ACC already require manufacturers to meet certain specifications for permissible engines (see, for example, existing § 36.44(c)). As engine manufacturers already fix settings to altitudes where the equipment is being used and follow requirements concerning the fuel injection pump, there are no compliance costs associated with this requirement for permissible engines or nonpermissible engines that have part 32

approval. For those nonpermissible engine models without part 32 approval, any applicable compliance costs were computed earlier in the discussion of nonpermissible engines.

Section 7.86 - Test Equipment and Specifications

This section describes the principal equipment required to perform the tests found in § 7.87, § 7.88, and § 7.89. In addition, On November 11, 1992, the International Standards Organization (ISO) published certain standards concerning testing of diesel engines. Currently, MSHA's test equipment, specifications and procedures for testing diesel engines are somewhat different than ISO's. In this section, MSHA has become more consistent with ISO testing equipment, specifications and procedures as they pertain to diesel engine testing. The standardization of MSHA and ISO standards with respect to diesel engine test equipment and specifications and procedures; will result in manufacturers being able to forego any costs associated with having two different sets of test equipment, specifications and procedures when testing a diesel engine in order to receive MSHA approval and to conform to ISO standards.

Sections 7.86(a)(1)(i) through (a)(1)(viii) require that a dynamometer test cell be provided with the equipment described in this section in order to measure various engine parameters. This type of equipment has been used in the MSHA laboratory for many years and is typical of equipment used by diesel engine manufacturers. MSHA estimates that there are no compliance costs

with these provisions for permissible engines or nonpermissible engines that have part 32 approval. For those nonpermissible engine models without part 32 approval any applicable compliance costs were computed earlier in the discussion of nonpermissible engines.

Section 7.86(a)(2) lists the specifications for No. 2 diesel fuel used during the tests. These specifications are typical of readily available No. 2 diesel fuel and will result in minor compliance costs.

Section 7.86(a)(3) requires that the test fuel temperature at inlet to the diesel engine's fuel injection pump be controlled to the engine's manufacturers specifications. As all applicable permissible and nonpermissible engines are already in compliance with this standard, there are no associated compliance costs.

Section 7.86(a)(4) requires that the engine coolant outlet temperature (if applicable) shall be maintained at normal operating temperatures as specified by the engine manufacturer. There are no compliance costs associated with this provision.

Section 7.86 (a)(5) requires the charge air temperature and cooler pressure drop be set to within ±7◦F(4◦C) and ±0^N59 inches Hg(2kP_a), respectively, of the manufacturer's specification. As all applicable permissible and nonpermissible engines are already in compliance with the standard, there are no associated compliance costs.

Sections 7.86(b)(1) through (b)(9) details construction requirements and components of the gaseous emission sampling

system as well as other related items. No compliance costs are associated with these sections because manufacturers can fulfill these requirements.

Sections 7.86(b)(10) through (15) describes general and detailed specifications for each gas analyzer used in the emission sampling system. The types of analyzers described are currently used by the ACC and are typical of instruments used by diesel engine manufacturers. Thus, there are no associated compliance costs for permissible engines or nonpermissible engines that have part 32 approval. For those nonpermissible engine models without part 32 approval, any applicable compliance costs were computed earlier in the discussion of nonpermissible engines.

Sections 7.86(b)(16) through (22) list the specifications for the calibration, span, and zero grade gases. No compliance costs are associated with these sections for permissible engines or nonpermissible engines that have part 32 approval. For those nonpermissible engine models without part 32 approval, any applicable compliance costs were computed earlier in the discussion of nonpermissible engines.

Section 7.86(c) describes the equipment and certain conditions needed to establish a particulate sampling system. This section involves a standard method of measuring whole diesel particulate. There are no associated compliance costs because the method is already used by engine manufacturers for other government agency requirements.

Section 7.87 - Test for Determination of Maximum Fuel-Air Ratio

This section describes the tests for determining the maximum fuel-air ratio as referenced in § 7.84(b). Concerning permissible engines, this test procedure was derived from existing § 36.44 and § 36.41 and is being conducted as part of the approval process. With respect to nonpermissible engines which have part 32 approval, this test procedure is similar to that required in part 32.4(f)(1). Thus, there will be no compliance costs for either permissible engines or nonpermissible engines that have part 32 approval. For those nonpermissible engine models without part 32 approval, any applicable compliance costs were computed earlier in the discussion of nonpermissible engines.

Section 7.88 - Test for Determination of Ventilation Rate

This section concerns test procedures for determining the ventilation rate referenced in § 7.84(c). Emission data in conjunction with engine performance data allow this ventilation rate to be determined. With respect to permissible engines, this test procedure was derived from existing § 36.43 and § 36.45 and is being conducted as part of the approval process. Concerning nonpermissible engines, this test procedure is similar to § 32.5(a)(2). MSHA estimates that there will be no compliance costs for permissible engines or nonpermissible engines that have part 32 approval. For those nonpermissible engine models without part 32 approval, any applicable compliance costs were computed

earlier in the discussion of nonpermissible engines.

Section 7.89 - Test for Determination of Particulate Index

This section describes the test procedure for determining the particulate index referenced in § 7.84(e). The tests are performed to determine the concentration by weight of diesel particulate in whole diesel exhaust. The compliance costs have been determined earlier in the discussion of permissible and nonpermissible engines.

Section 7.90 - Approval Marking

This section requires that a permanent and legible approval plate containing specific information be attached to diesel engines. Currently, MSHA does not require this, but most, if not all, manufacturers already provide some of the required information. As reported by two engine manufacturers, the incremental compliance cost of including the additional information is between $0.80 per plate and $5.00 per plate depending on the plate, how it is attached, labor time needed, etc. MSHA used the average of $2.90 for each plate. With respect to manufacturer's costs, MSHA assumed that the yearly average numbers of diesel-powered equipment introduced into mines between 1984 and 1994 (20 pieces of permissible diesel-powered equipment and 128 pieces of nonpermissible diesel-powered equipment) as a projection of this equipment in future years. On that basis, MSHA estimates that the annual costs of plates on new

pieces of permissible equipment will be about $50 (20 x $2.90). Similarly, the annual costs of plates on new pieces of nonpermissible diesel-powered equipment will be about $400 (128 x $2.90).

Section 7.91 - Post-Approval Product Audit

If an MSHA inspector discovered potential problems with a previously approved engine, then under § 7.91, MSHA could require that the approval holder make a diesel engine available for audit at no cost. This type of situation is unlikely to occur or may occur no more than once a year. The manufacturer's cost to ship an engine to MSHA would be between $200 to $400. Thus, the compliance costs would be minimal.

Section 7.92 - New Technology

This section allows MSHA to consider new technology that may help to address safety aspects of diesel-powered engines. There are no compliance costs associated with this provision, since it tends to address future developments not known at this time. This provision is actually a benefit to manufacturers since it allows MSHA to build flexibility in the rule to address future technology.

PART 7 - SUBPART F
DIESEL POWER PACKAGES INTENDED FOR USE IN AREAS WHERE PERMISSIBLE ELECTRIC EQUIPMENT IS REQUIRED

Introduction and Summary

Part 7, subpart F establishes requirements for MSHA approval of diesel power packages intended for use in underground coal mine areas where equipment is required to be permissible. With respect to part 7, subpart F, MSHA estimates that one time costs for manufacturers will be $52,800. The annualized costs will be $3,700. The total annual costs are estimated to be about $4,100. This cost mainly reflects modifications to existing safety component system approvals and costs for exhaust temperature sensor devices noted in § 7.98(s)(4)(ii).

Power Package Cost

There is no additional burden on manufacturers for filing an application for approval for a new diesel power package because the amount of tests and paperwork needed by MSHA would be equivalent to that required if the application were requested under the existing part 36 regulations. Under existing part 36 a safety components system now approved by MSHA is similar to a diesel power package that will be approved under part 7, subpart F. In the future, manufacturers will seek approval for a new diesel power package under part 7, subpart F, rather than seeking approval for a safety components system under part 36. With respect to new diesel power packages for which approvals will be sought in the future by manufacturers, there will be an

annual reduction in the amount of existing cost incurred by manufacturers under part 36 and an equivalent annual cost will appear under part 7, subpart F. MSHA estimates that yearly, manufacturers will seek approval under part 7, subpart F, for between 1 and 2 (for an average of 1.5) new diesel power packages. The average cost for the power package tests is estimated to be approximately $20,000. The annual costs for power package tests concerning new diesel power packages will be about $30,000 [1.5 new applications x $20,000]. There will be an equivalent cost reduction of $30,000 per year under part 36, since these applications will now be processed under part 7, subpart F, rather than under Part 36. Thus, the cost increase under part 7, subpart F, for seeking approval for a new power package will be offset because the manufacturer will no longer seek a safety components system approval under existing part 36.

Certain existing safety components system certifications previously issued by MSHA to a manufacturer could be used to comply with the requirements for a diesel power package under part 7, subpart F. This could happen if the manufacturer files an application with MSHA requesting that the existing safety components system previously approved under part 36 now be approved under part 7, Subpart F. MSHA estimates that this will be the case for about 33 existing safety components system approvals. The average cost for the power package tests is estimated to be approximately $1,600. MSHA estimates that the one time cost to process the 33 existing approvals will be about

$52,800 [33 existing applications x $1,600]. The one time cost of $52,800 was annualized at 7 percent to be about $3,700 [$52,800 x 0.07]. It will take 12 hours to prepare and submit additional information for an existing application at a rate of $75 per hour. These costs will occur only once and were annualized at a rate of 7 percent. The one time application costs are estimated to be about $2,000 [33 existing applications x 12 hours x $75 per hour x 0.07].

Section 7.95 - Purpose and Effective Date

This section establishes specific requirements for MSHA approval of permissible diesel power packages. Part 7, subpart F diesel power packages are intended for use areas of the mine where methane and combustible materials are present.

Part 7, subpart F, will enable applicant or third party testing of power packages. Concerning the tests conducted under subpart F, MSHA believes that the industry will not have significant difficulty preparing, at prices comparable to MSHA's, for most tests required under subpart F. However, because test facilities to conduct explosion tests are not available at this time, MSHA will continue to perform such testing until it determines that the competitive capacity exists in the private sector. MSHA believes that diesel power package manufacturers and certain research facilities are familiar with explosion tests for both diesel and electrical components, and they could construct adequate test apparatus without significant capital investment.

Section 7.96 - Definitions

This section contains definitions applicable to part 7, subpart F. There will be no compliance costs for this section.

Section 7.97 - Application Requirements

This section requires applicants to provide: diesel engine specifications; a general arrangement drawing; a schematic of the cooling system; a schematic of the safety shutdown system; detailed drawings or specifications for certain components of the cooling system; detailed drawings of various gaskets; and other relevant information needed to document compliaNce with the section. The ACC reported that all manufacturers already provide this information as part of the application requirements under existing § 36.6(b) or existing policy. There will be no associated compliance costs.

Section 7.98 - Technical Requirements

The technical requirements for approval of the diesel power packages under § 7.98 are based on existing sections in parts 18 and 36.

Section 7.98(a) requires that diesel engines be approved for use in underground mines prior to testing the complete diesel package. As this is similar to existing § 36.21 and manufacturers are in compliance, there will be no associated compliance costs.

Section 7.98(a)(1) requires that starting mechanism be hydraulic, pneumatic, or of other acceptable means. As this is similar to existing § 36.21 and manufacturers are in compliance, there will be no associated compliance costs.

Section 7.98(a)(2) requires systems using air compressors to have the intake air line of the compressor connected to the intake system between the air cleaner and flame arrester or to have an integral air filter. This requirement is implied in existing § 36.23(a) in which connections to intake systems must be explosion-proof. As manufacturers are currently complying with this requirement, there will be no associated compliance costs.

Section 7.98(b) consists of three components. The first component requires that the maximum attainable external surface temperature of a diesel power package be 302 °F (150 °C). Although existing § 36.25(d)(1) allows a maximum surface temperature of 400 °F for any external surface of the engine or exhaust system, that requirement applies for non-coal mines. A more stringent requirement of 302 °F was derived from existing § 18.23 which regulates external surface temperatures of electrical motor driven mine equipment. The more stringent requirement has been applied to coal mines because some types of coal dust ignite at 305 °F. Manufacturers currently comply with the 302 °F requirement because diesel power packages intended for use in coal mines are currently tested at 302 °F.

The second component requires that water-jacketed parts have

a positive coolant circulation and a properly vented system. Positive circulation of the coolant is currently required by § 36.25(d)(1). The venting requirement is new but it assists with positive circulation and MSHA believes that it will not impose additional compliance costs.

The third component requires installation, in the hottest point of a coolant system, of a temperature sensor that will shut down the engine before the coolant temperature exceeds manufacturer's specifications or 212 °F (100 °C). As existing § 36.25(d)(1) requires a sensor to shut off the engine before the coolant exceeds 212 °F (100 °C), manufacturers are in compliance and there will be no associated compliance costs.

Section 7.98(c) allows a maximum of 0.6 percent magnesium content of aluminum alloys of internal/rotating parts. Existing § 36.20(b) states that the quality of the material shall conform to part 18, which limits magnesium content to 0.5 percent. MSHA policy however, has permitted the use of 0.6 percent magnesium. Thus, there will be no associated compliance costs or cost reductions.

Sections 7.98(d) and (e) require that nonmetallic rotating parts and rubber V-belts not accumulate static electricity. Existing § 36.20(b) references part 18 and existing § 18.26 specifies the static electricity requirement. As § 7.98(d) and (e) requirements are similar to existing requirements, and there will be no associated compliance costs.

Section 7.98(f) prohibits the engine crankcase breather discharge to be connected to the intake system. While no existing standard can be tied directly to § 7.98(f), existing § 36.23(d) requires that only clean air shall enter the flame arrester. For all practical purposes, this existing provision forbids the crankcase breather from being connected to the intake system. As manufacturers are in compliance with this provision, there will be no associated compliance costs. This section also requires the discharge of the breather to be directed away from hot surfaces of the engine and exhaust system. As existing § 36.25(d)(3) forbids accumulation of combustible material on surfaces, there will be no associated compliance costs.

Sections 7.98(g) and (h) require electrical components and systems utilized on diesel power packages to be evaluated and approved by MSHA prior to installation of diesel power packages. As existing § 36.32(a) and (b) contain similar requirements, manufacturers are in compliance and there will be no associated compliance costs.

Section 7.98(i)(1) requires diesel power packages to be equipped with a coolant temperature sensor which will shutdown the engine if the coolant temperature exceeds either the manufacturer's specifications or 212 °F. As existing § 36.25(d)(1) requires the use of this temperature sensor and § 36.47(g) describes the test for the 212 °F sensor, there will be no associated compliance costs.

Section 7.98(i)(2) requires diesel power packages to have an

exhaust gas temperature sensor which will shutdown the engine if the exhaust gas temperature exceeds 302 °F, or 185 °F if the system utilizes an exhaust water scrubber conditioner. This requirement relaxes existing requirements that did not provide for dry exhaust systems. Existing § 36.25(c)(1) requires a device that will automatically shutdown the engine before the exhaust gas exceeds 185 °F. Thus, this device could be either the low-water shutdown float or the exhaust gas temperature sensor or both, if necessary, to meet the requirements of existing § 36.25(c)(1). The 302 °F sensor for dry exhaust systems was added because the temperature effects of 302 °F exhaust gas in a mine environment are the same as the effects of 302 °F machine external surfaces. There are no compliance costs associated with this standard.

Section 7.98(i)(3) requires diesel power packages to have a low water shutdown sensor for systems utilizing exhaust conditioners. This section also requires replenishing the water before restarting the engine. There are no costs for this section because the requirements already are meet by existing § 36.25(c)(1).

Section 7.98(j)(1) requires features for disabling the starting circuit and preventing engagement while the engine is running or requiring the starter gears to be constructed of nonsparking materials. The disabling device is already required by the ACC pursuant to Alternate Application Procedures (PC-40-25-0).

Section 7.98(j)(2) requires that an oil pressure override

not be capable of overriding safety shutdown sensors specified in § 7.98(i). Although this requirement is not explicitly stated in existing standards, this is MSHA's policy. As manufacturers have had to meet this policy, they are in compliance and there will be no associated compliance costs.

Section 7.98(k) requires diesel power packages to pass the explosion tests of § 7.100 and to meet technical design requirements of § 7.98(l) through (q) in order to be approved. As this standard is implied by existing § 36.10, manufacturers are in compliance and there will be no associated compliance costs.

Section 7.98(l) requires approved diesel engines to meet the same requirements as stated in § 7.98(k) except that engine joints directly or indirectly connecting the combustion chamber to the surrounding atmosphere must be explosion-proof in accordance with §7.89(m) through (q). MSHA experience has shown that normal engine design tolerances provide safe explosion-proof joints. As manufacturers are in compliance with this requirement, there will be no associated compliance costs.

Section 7.98(m) requires each intake or exhaust system component to be structurally sound. Existing § 36.23(a) and § 36.25(a) require components to be designed to withstand an internal pressure of either four times that seen in explosion tests or 125 pounds per square inch. Although the requirement is being increased to 150 pounds per square inch to conform with existing § 18.31(a)(1), MSHA does not foresee any significant

cost increase because most manufactured components are already structurally adequate to withstand the increased pressure.

Section 7.98(n) requires welded joints to be continuous, sound, and gas tight to prevent passage of flames caused by internal explosions. This standard is not specified in part 36 but is implied by construction requirements of existing § 36.23(a) and § 36.25(a). As manufacturers are in compliance, there will be no associated compliance costs.

Section 7.98(o) states that flexible connections shall be permitted in segments of the intake and exhaust systems required to provide explosion-proof features. This provision clarifies existing MSHA policy which manufacturers are in compliance with and, thus, there will be no associated compliance costs. Moreover,existing § 36.20(a) allows for various designs as long as construction and design meet technical test criteria established by MSHA.

Section 7.98(p) defines technical design requirements for explosion-proof joints in the intake and exhaust systems. Existing § 36.23(a) and § 36.25(e) specify these design requirements for joints and manufacturers are in compliance with such requirements. Thus, there are no associated compliance costs.

Sections 7.98(p)(1) and (2) require flanged metal to metal joints which meet the requirements of § 7.98(q) or metal flanges fitted with metal gaskets. According to the ACC this provision is similar to existing § 36.23(a), which references § 36.20(b),

which references part 18. As manufacturers are in compliance with the standard, there will be no associated compliance costs.

Section 7.98(p)(2)(i) specifies design requirements for flanges used for explosion-proof joints. As these requirements are similar to existing § 18.31(a)(6) and § 18.33, manufacturers are in compliance and there will be no associated compliance costs.

Section 7.98(p)(2)(ii) requires a means to ensure tight explosion-proof joints. This requirement was derived from existing § 18.32(b) and as manufacturers are in compliance, there will be no associated compliance costs.

Section 7.98(p)(2)(iii) requires fastenings for explosion-proof joints to be as uniform in size as possible. This provision is derived from existing § 18.32(c) which is not applicable to diesel-powered equipment. However, MSHA experience reveal that manufacturers are in compliance with the requirement. Thus, there will be no associated compliance costs.

Section 7.98(p)(2)(iv) specifies requirements for holes for fastenings in explosion-proof enclosures. This provision is derived from existing § 18.32(d) which is not applicable to diesel-powered equipment. However, MSHA experience reveal that manufacturers are in compliance with the requirement. Thus, there will be no associated compliance costs.

Section 7.98(p)(2)(v) specifies requirements For the use of fastenings. This provision is derived from existing § 18.32(f) which is not applicable to diesel-powered equipment. However,

MSHA experience reveal that manufacturers are in compliance with the requirement. Thus, there will be no associated compliance costs.

Section 7.98(p)(2)(vi) specifies the minimum thickness for flanges. This provision is derived from existing § 18.32(a)(6) which is not applicable to diesel-powered equipment. However, the ACC reports that manufacturers are in compliance with this requirement. Thus, there will be no associated compliance costs.

Section 7.98(p)(2)(vii) specifies that the maximum fastening spacing shall be 6 inches. This provision is derived from existing § 18.32(a)(6) which is not applicable to diesel-powered equipment. However, MSHA experience reveal that manufacturers are in compliance with this requirement. Thus, there will be no associated compliance costs.

Section 7.98(p)(2)(ix) provides that minimum thread engagement of fastenings shall be equal to or greater than the nominal diameter of the fastenings specified in § 7.98(p)(2)(viii). MSHA experience reveal that manufacturers are in compliance with § 7.98(p)(2)(viii) and (ix). Thus, there will be no associated compliance costs.

Section 7.98(p)(1)(x) formally establishes acceptable design criteria for metal gaskets. This provision is new and was developed after an extensive literature search and discussions with manufacturers. It provides guidelines for acceptable gaskets without requiring extensive evaluation by MSHA. At times, gaskets submitted to MSHA have been of unacceptable

designs and could have resulted in premature failure. By providing guidelines for acceptable gaskets, MSHA believes that final products will be less likely to fail. There will be no associated cost of compliance because this requirement informs manufacturers, who have alternative equal cost items, which gaskets will be acceptable.

Sections 7.98(q)(1) through (q)(7) specify many technical design requirements for construction of explosion-proof systems. Existing § 18.3(a)(6), § 18.32, and § 18.33 were used to develop these requirements and as manufacturers are in compliance with these standards, there will be no associated compliance costs.

Section 7.98(r)(1) requires an emergency intake air shutoff device to be located in the intake system between the air cleaner and intake flame arrester. MSHA's policy already require manufacturers to comply with this standard before a power package is approved. MSHA believes that there will be no associated compliance costs.

Section 7.98(r)(2) requires a flame arrester in the intake system to prevent internal ignitions from propagating to the environment. MSHA experience reveals that this requirement is similar to existing § 36.23(b)(1) and, as manufacturers are in compliance, there will be no associated compliance costs.

Section 7.98(r)(3) specifies intake flame arrester designs that are acceptable for the intake system and for testing under § 7.100. This section provides for crimped ribbon flame arresters. The crimped ribbon flame arresters have been allowed

under existing § 36.20. As manufacturers are in compliance, there will be no associated compliance costs.

Section 7.98(r)(4) requires an air cleaner and service indicator to be installed in the intake system of the diesel power package. Existing § 36.23(d) requires an air cleaner in the intake system and MSHA policy has required a service indicator for approvals under part 36. As manufacturers are in compliance, there will be no associated compliance costs.

Section 7.98(r)(5) requires a port in the intake system of diesel power packages. This requirement is similar to existing § 36.23(e). As manufacturers are in compliance, there will be no associated compliance costs.

Section 7.98(s)(1) requires that flame arresters be designed to prevent an explosion within the system from propagating to a surrounding atmosphere. This provision also provides requirements for both wet and dry types of exhaust systems. For the wet type of exhaust system, the requirements are similar to those in § 36.25. As manufacturers are in compliance, there will be no compliance costs associated with wet types of exhaust systems.

In the past, existing part 36 only allowed the use of the wet type of exhaust system on permissible equipment because the technology for the dry system was not advanced enough to address MSHA's safety concerns regarding fire and explosion hazards on diesel-powered equipment. However, currently technology for the dry system is advanced to address such safety concerns for the

dry systems and the mine operator now has a choice to use either a wet or dry system.

Section 7.98(s)(2) allows wet exhaust conditioners to be used as the exhaust flame arrester provided that explosion tests of § 7.100 demonstrate that exhaust conditioners will arrest flame. When used as a flame arrester, the wet exhaust conditioner shall be equipped with a sensor to automatically activate the safety shutdown system at a minimum low water level specified in § 7.100. This requirement is similar to existing § 36.25(b)(3) where the sensor is required. This section also requires that engines cannot be restarted until the water supply in the wet exhaust conditioner has been replenished, which is similar to existing requirements in § 36.25(c)(1). As manufacturers are in compliance with these requirements, there will be no associated compliance costs.

Section 7.98(s)(3) requires the exhaust system to be designed so that improper installation of the flame arrestor is impossible. As manufacturers are in compliance, there are no associated compliance costs.

Section 7.98(s)(4) specifies that the exhaust system shall provide a means to cool exhaust gas and prevent discharge of glowing particles. As existing § 36.25(c)(1) requires an engine exhaust cooling system, manufacturers are in compliance and there will be no associated compliance costs.

Section 7.98(s)(4)(i) specifies that when a wet exhaust conditioner is used a maximum exhaust gas discharge temperature

from the power package not exceed 170 °F (76 °C). In addition, this provision requires a sensor to activate the safety shutdown system before the exhaust gas exceeds 185 °F (85 °C). As sensors of relatively similar design and function are currently required under part 36.25, there will be no associated compliance costs for manufacturers.

Section 7.98(s)(4)(ii) requires a low water shutdown sensor and an exhaust temperature sensor. The function of these two devices is to activate the safety shutdown system before the exhaust gas temperature at discharge from the exhaust conditioner exceeds 302○F (150○C). Currently, part 36.25(c)(1) accepts the use of one of these devices. Although most existing and new permissible equipment have only the low water shutdown device, part 36 does not preclude the use of both if one device is not adequate. Existing permissible equipment approved under part 36 that is currently in use in underground coal mines is exempted from this standard. Thus, only new permissible equipment is affected by this standard and manufacturers will therefore incur costs for the addition of an exhaust gas temperature sensor.

The ACC estimates that all new permissible equipment have low water shutdown devices and about 10 percent of such equipment have exhaust temperature sensor devices. Thus, approximately 90 percent, or 16 pieces (18 x .90), of all new manufactured permissible equipment that is introduced into mines annually will need an exhaust temperature device. The purchase and installation of an exhaust temperature sensor is approximately

$100, and require about 30 minutes of maintenance labor each month to calibrate the device. One years maintenance costs at a labor rate of $26 per hour will be about $156 [(30/60 x $26) x 12 mos.]. The annual costs related to the exhaust temperature sensor are about $4,100 [(16 x $100) + (16 x $156)]. There are no first year or annualized costs.

Section 7.98(s)(5) allows for other means, such as future technological improvements, for cooling exhaust gas and preventing the propagation of flame or discharge of glowing particles. As this requirement is implied by existing § 36.20(a), manufacturers are fully in compliance and there will be no associated compliance costs.

Section 7.98(a)(6) requires a port designed for measurement of total exhaust back pressure in the exhaust system of the diesel power package. As this requirement is similar to existing § 36.25(g), manufacturers are in compliance and there will be no associated compliance costs.

Section 7.99 - Critical Characteristics

This section lists critical characteristics of diesel power packages that must be inspected or tested by manufacturers prior to shipment. Inspecting or testing these characteristics are requirements implied by existing § 36.11(c) and (d). For example, existing § 36.11(d) "obligates the applicant to whom the certificate of approval was granted to maintain in his plant the quality of each complete assembly ... and guarantees that it is

manufactured and assembled according to the drawings, specifications, and descriptions upon which a certificate of approval was based." MSHA experience reveals that manufacturers are almost completely, if not completely, in compliance with these requirements. Therefore, manufacturers will incur minimal, if any, compliance costs.

Section 7.100 - Explosion Tests

This section describes the explosion tests that must be performed as referenced in § 7.98 and is derived mainly from § 36.46.

Section 7.100(a)(1) describes items, noted below, that need to be performed or established prior to installation of the diesel power package in the explosion test chamber. There are no associated compliance costs.

Section 7.100(a)(1)(i) requires a detailed inspection of parts against the drawings and specifications prior to testing. These requirements are similar to existing § 36.42 and are conducted as part of the approval process. Thus, there are no associated compliance costs.

Sections 7.100(a)(1)(ii) through 7.100(a)(3)(v) describe procedures for conducting explosion tests. These procedures were developed by the ACC based on past experiences and current test methods. Although specific procedures outlined in these sections are new because existing part 36 does not specify actual procedures, these procedures do not differ from current industry

practices. Thus, MSHA believes that there are no associated compliance costs.

Section 7.100(b) defines the requirements for acceptable performances of diesel power packages during and after completion of explosion tests. These performance criteria were derived from existing § 36.46(a) and (c) and some may be considered to be specification-oriented. Nevertheless, MSHA experience reveals that these criteria are current practices. There are no associated compliance costs.

Section 7.101 - Surface Temperature Tests

This section describes surface temperature tests that must be performed as referenced in § 7.98. The surface temperature tests determine whether the temperature of any surface of the diesel power package can exceed 302 °F. Although existing § 36.48 prohibits the temperature of any diesel power package surface to exceed 400 °F, MSHA policy has been to evaluate diesel power packages under the 302 °F requirement. As a result, these requirements do not differ from current practice and there will be no associated compliance costs.

Section 7.101(a)(1)(i) requires a detailed inspection of the parts against the drawings and specifications prior to testing. This requirement is similar to existing § 36.42. As manufacturers are in compliance with the requirement, there will be no associated compliance costs.

Sections 7.101(a)(1)(ii) through (b) describes the surface

temperature tests that must be performed as referenced in § 7.98. These tests and procedures were developed by the ACC based on past experiences and current test methods. Although the procedures are new, in that, part 36 does not specify the actual procedures, they do not differ from current industry practices. Consequently, there will be no compliance costs associated with these tests.

Section 7.102 - Exhaust Gas Cooling Efficiency Tests

This section describes the exhaust gas cooling efficiency tests that must be performed as referenced in § 7.98. As these tests are similar to those required in existing § 36.47 and do not differ from current industry practices, there will be no associated compliance costs.

Section 7.103 - Tests of the Safety System Controls

This section involves the requirements for and testing of the safety system controls on diesel-powered equipment.

Sections 7.103(a)(1) and 7.103(a)(2) describe requirements for testing the effectiveness of coolant system temperature shutdown sensors. These tests are conducted to ensure that safety system controls are designed and functioning properly. As the tests requirements are similar to existing § 36.47 and do not differ from current industry practices, there will be no associated compliance costs.

Section 7.103(a)(3) describes procedures for testing the

exhaust gas temperature sensor. The temperature sensor is acceptable if it automatically activates the safety shutdown system and stops the engine before the cooled exhaust exceeds 302 °F (150 °C). This type of temperature sensor only applies to alternate dry exhaust systems. The dry exhaust system is not required, but is an alternate method which the equipment manufacturer may choose in lieu of a wet exhaust system. MSHA estimates that there will be no compliance costs with this provision as these requirements do not differ from current industry practices.

Section 7.103(a)(4) describes laboratory procedures for testing the exhaust gas temperature sensor for systems using wet exhaust conditioners where the exhaust gas temperature does not exceed 170 °F (76 °C) under test conditions of § 7.100(a)(2) of part 7, subpart F. As these are current industry practices, there will be no associated compliance costs.

Section 7.103(a)(5) describes procedures for testing the low water sensor when a wet exhaust conditioner is used as the flame arrester. Although existing § 36.25(b)(3) requires a low water sensor, there is no specific test for its evaluation in part 36. However, ACC developed a test for evaluating the low water sensor after part 36 was promulgated. As the requirements in this provision do not differ from current practices, there will be no associated compliance costs.

Section 7.103(a)(6) describes procedures for testing the intake air emergency shutoff device. Although part 36 does not

provide for testing the intake air emergency shutoff device, the ACC has developed a test that is currently used for part 36 certifications. As the requirements in this section do not differ from current practices, there will be no associated compliance costs.

Sections 7.103(a)(7) and (a)(8) describe procedures for measuring the total intake vacuum and total exhaust back pressure of the engine. Although part 36 does not provide for such procedures, the measuring procedures are those recommended by engine manufacturers and are currently being used for part 36 certifications. As the requirements in this standard do not differ from current practices, there will be no associated compliance costs.

Sections 7.103(a)(9) and 7.103(a)(10) require: (1) the starting mechanism to be tested while the engine is running and; (2) the engine oil pressure override mechanism to be tested to ensure that it does not override required safety shutdown devices. Although these tests are not addressed in part 36, the ACC currently requires such tests for part 36 certifications. As these requirements do not differ from current industry practices, there will be no associated compliance costs.

Section 7.103(b) identifies acceptable criteria for safety system controls. These are performance criteria and will not result in any compliance costs.

Section 7.104 - Static Pressure Test

This section describes the internal static pressure test that must be performed to determine if the designs of the intake and exhaust system components are structurally sound. Although existing § 36.23(a) and § 36.25(a) reference pressure testing, the test is not specified. Nevertheless, the ACC has developed a test that is currently used for part 36 certifications. Consequently, requirements in this section do not differ from current practices and there will be no associated compliance costs.

Section 7.105 - Approval Marking

This section contains a new requirement that a legible and permanent approval plate inscribed with the assigned MSHA approval number and exhaust conditioner grade limitation be attached to safety power packages that are on permissible diesel-powered machines. Using the average cost for installing an approval plate of about $2.90 and that 20 new pieces of permissible equipment are introduced annually, the annual cost will be about $50.

Section 7.106 - Post-Approval Product Audit

This section, which is similar to existing § 36.9(a), requires an approval holder to make an approved diesel power package available for audit at a mutually agreeable site and time. As the ACC has not recently conducted any formal post-

approval product audits and does not foresee conducting any in the near future, there will be no associated compliance costs.

Section 7.107 - New Technology

This section allows MSHA to approve diesel power packages that may incorporate technology for which the specific requirements of part 7, subpart G, are not appropriate. This provision is similar to existing § 36.20(a), which allows MSHA to modify construction and design requirements of subassemblies or components. This provision is included MSHA cannot foresee all possible designs, arrangements, or combinations of components or materials that will improve or sustain the same level of miner safety and health, while increasing productivity and/or decreasing costs. MSHA believes that this provision will increase flexibility and allow MSHA to address new technology and thus decrease costs.

Section 7.108 - Power Package Checklist

This section requires approval holders to provide a checklist with each approved diesel power package. This checklist will identify features that must be checked or tested in order to determine whether diesel power packages are in approved condition. As MSHA's policy since 1983 has required applicants to supply a draft permissibility checklist to the Agency, at the time of submitting an application, there are no expected compliance costs associated with the creation of the

checklist.

Section 70.1900 - Exposure Monitoring

Section 70.1900 requires area sampling and designates actions to be taken based upon the sampling results.

Section 70.1900(a) requires that during on-shift examinations required by § 75.362 a certified person designated by the operator shall determine carbon monoxide (CO) and nitrogen dioxide (NO_2) concentrations. There are no compliance costs related to certification because the certified person noted above can be the same person currently making methane checks for the on-shift examination required by existing § 75.362.

Section 70.1900(a)(1) requires area sampling in the return of each working section where diesel equipment is used at a location which represents the contribution of all diesel equipment on such section. There will be compliance costs related to sampling for this provision. In order to accomplish the sampling requirements of § 70.1900 MSHA estimates that mines will have to purchase instantaneous gas analyzing devices capable of providing multiple gas readings simultaneously. Since these instruments will be used to do the sampling required in various provisions under § 70.1900, the compliance costs for such equipment is determined in § 70.1900(b)(1) and (b)(2), rather than in each provision below where sampling is estimated to occur.

Pursuant to paragraph (a)(1) area samples of CO and NO_2 will need to be taken in 2 to 4 areas (for an average of 3 areas) in

large mines and 1 to 2 areas (for an average of 1.5 areas) in small mines. Samples will be taken on every shift in all 158 large and 15 small mines. Generally, large mines using diesel equipment have 2 shifts and small mines have 1 shift. Large mines operate 5 days per week for 50 weeks (250 working days) and small mines operate 4 days per week for 40 weeks (160 working days). The response time to display readings, with regards to the instantaneous gas analyzer devices noted above, is estimated not to exceed 1 minute, or 0.0167 hours. The labor cost for the mine examiner is valued at $34.50 per hour. The $34.50 rate is based on a weighted average which assumes that a certified supervisory type person earning $37.50 per hour will perform the examinations 75 percent of the time and; a certified person earning $26 per hour will perform the examination 25 percent of the time. Based upon this data, the annual compliance costs to take area samples in accordance with paragraph (a)(1) will be $138,625, of which large mines will incur about $136,550 [((158 mines x 2 shifts) x 3 areas x 250 days) x 0.0167 x $34.50] and; small mines will incur about $2,075 [((15 mines x 1 shift) x 1.5 areas x 160 days) x 0.0167 x $34.50].

Section 70.1900(a)(2) requires that during the on-shift examinations required by § 75.362, concentrations of CO and NO_2 must be determined in the area of the section loading point if diesel haulage equipment is operated on the working section. MSHA estimates that about 50 percent of large mines (about

79 mines) and about 40 percent of small mines (about 6 mines) will be affected by this section. Pursuant to paragraph (a)(2), area samples of CO and NO_2 will need to be taken in 3 to 4 areas (for an average of 3.5 areas) in a large mine and 1 to 2 areas (for an average of 1.5 areas) in a small mine. The information for large and small mines concerning: the number of shifts; the number of workdays; the time required to sample; and the labor costs are the same as determined in paragraph (a)(1) above. Thus, the annual costs to sample under paragraph (a)(2) will be $80,500, of which large mines will incur about $79,650 [(79 mines x 2 shifts) x 3.5 areas x 250 days) x (0.0167 hrs. x $34.50)] and small mines will incur about $850 [(6 mines x 1 shift) x 1.5 areas x 160 days) x (0.0167 hrs. x $34.50)].

Section 70.1900(a)(3) requires that the concentration of CO and NO_2 be determined during on-shift examinations at a point inby the last piece of diesel equipment on the longwall or shortwall face when mining equipment is being installed or removed. The costs associated with taking these samples are included in costs determined in paragraph (a)(1) above.

Section 70.1900(a)(4) requires area samples to be taken in any other area designated by the District Manager as stipulated in the mine operator's approved ventilation plan where diesel equipment is operated in a manner which can result in significant concentration of diesel exhaust. This provision will not apply to all mines but rather to those that have unique ventilation systems. MSHA estimates that 10 percent of large mines (about

16 mines) and 10 percent of small mines (about 2 mines) will be affected by this section. Pursuant to paragraph (a)(4) area samples of CO and NO_2 will need to be taken in 1 to 2 areas (for an average of 1.5 areas) in both large and small mines. The information for large and small mines concerning: the number of shifts; the number of workdays; the time required to sample; and the labor costs are the same as determined in paragraph (a)(1) above. Thus, the annual costs to sample under paragraph (a)(4) will be $7,200, of which large mines will incur about $6,925 [((16 x 2 shifts) x 1.5 areas x 250 days)) x (0.0167 hrs. x $34.50)] and small mines will incur about $275 [((2 x 1 shift) x 1.5 areas x 160 days)) x (0.0167 hrs. x $34.50)].

Section 70.1900(b)(1) and (b)(2) requires that samples be collected such that results are available immediately to the person collecting such samples and that instruments used to measure exposures be maintained and calibrated. Currently, under existing mine ventilation standards, each mine operator must submit a mine ventilation plan that requires sampling of methane and oxygen. If the mine has diesel equipment it currently does some kind of sampling for CO and other noxious gases. Such measurements are currently taken with either an instantaneous gas analyzer device or with a sample pump kit and stain tubes. MSHA assumes that in order to conduct the area sampling required by § 70.1900 mines are likely to use instantaneous gas analyzer devices capable of providing multiple gas readings simultaneously, however, currently most mines do not have such

devices. Most instantaneous gas analyzer devices currently used by mines that have them provide readings for one gas only.

MSHA estimates that about 25 percent of large mines have instantaneous gas analyzer devices (about 3 devices per mine) capable of providing multiple gas readings simultaneously. In order to conduct the area sampling required by § 70.1900 MSHA estimates that both large and small mines will need 1 instantaneous gas analyzer device capable of providing multiple gas readings instantaneously per working section. Large mines are estimated to have 2 to 4 working sections (for an average of 3 working sections) per mines. Small mines are estimated to have 1 to 2 working sections (for an average of 1.5 working sections) per mine. Thus, 75 percent of large mines (119 mines) will need 3 devices per mine. All 15 small mines will need 1.5 devices each per mine. A mine cannot realistically purchase 1.5 devices, however, the 1.5 figure is an average which implies that some small mines will buy 1 device while others will purchase 2 devices. One manufacturer estimated that such a device will cost about $1,350, while another stated that it will cost about $1,600. MSHA used the average of these two prices ($1,475) for the cost of an instantaneous gas analyzer device that measures multiple gases, such as CO and NO_2.

The first year costs for purchasing equipment in order to conduct area sampling will be about $559,775, of which large mines will incur about $526,575 [(119 mines x 3 devices x $1,475)] and small mines will incur about $33,200 [15 mines x

1.5 devices x $1,475]. The instantaneous gas analyzer devices have a estimated life of 10 years, thus the first year costs were annualized over 10 years to be about $79,500, of which large mines incurred about $74,775 [$526,575 x 0.142] and small mines incurred about $4,725 [$33,200 x 0.142].

Maintaining the device requires maintenance and calibration. A battery pact costing $77 is suggested to be changed every 2 years; thus battery replacement cost annualized is about $40 per device. In addition, each device may have to replace a sensor costing between $200 and $250 (for an average of $225) at least once per year. Further, CO and NO_2 gas will be needed for calibration. A 103 liter bottle of CO gas will cost about $105 and has a shelf life of a little over a year. A 58 liter bottle of NO_2 gas will cost about $315 and has a shelf life of six months. About a liter or less of gas is used each time an instrument is calibrated. Thus, based on calibrations being performed once a month, then on an annual basis, for both large and small mines 1 bottle of CO and 2 bottles of NO_2 to calibrate the instruments will be sufficient. Although small mines will need to purchase fewer instruments and thus perform fewer calibrations they will still need to purchase the same amount of NO_2 gas as large mines because of the short term shelf life of the NO_2 gas. On an annual basis the cost of gas for calibrating a device for both large and small mines is $735 ($105 + $315 + $315).

The annual costs for maintaining and calibrating the device

for the affected mines will be about $199,075, of which large mines will incur about $182,075 [(($40 battery + $225 sensor) x 3 devices) + $735) X 119 mines] and small mines will incur about $17,000 [(($40 battery + $225 sensor) x 1.5 devices) + $735) x 15 mines].

Section 70.1900(b)(3) requires contaminant concentration determinations to be made during periods that are representative of conditions during normal operations. There are no compliance costs associated with this provision.

Section 70.1900(c) requires that when contaminant concentrations made in § 70.1900(a) exceed 50 percent of the threshold limit values the operator will take appropriate corrective action to reduce concentrations of CO and NO_2 below the applicable action level. In the past, samples taken by MSHA inspectors in mines that use diesel-powered equipment have shown that very infrequently has a sample exceeded 50 percent of the TLV. Thus, MSHA expects no more than 100 large mines and 10 small mines are expected to exceed the 50 percent level from samples required by this provision. Both large and small mines are estimated to exceed the level no more than 10 times per year. The corrective actions that may be taken are adjusting air quantity levels or checking maintenance of equipment. The compliance costs for such corrective actions are determined in other sections of the rule.

Paragraph (c) also gives the mine operator an opportunity to demonstrate, under § 75.325(j), that a modification of the

50 percent action level is appropriate for the mine. The sampling necessary to demonstrate that the personal exposure of miners would not exceed permissible limits is not specified by the final rule, recognizing that many approaches can be taken. For this analysis, MSHA uses personal exposure sampling for estimating compliance costs. With respect to personal sampling a miner performing a certain occupation may wear or have near his work area an instantaneous gas analyzer device that measures certain gases over a specific period of time (usually a shift). At the end of the period the instrument provides multiple gas readings simultaneously based upon the time period measured. MSHA estimates that very few mines, 5 percent of large mines (100 x 0.5) and 10 percent of large mines (10 x 0.10) that exceed the 50 percent action level noted above will want to conduct such personal exposure sampling. Thus, no more than 5 large mines and 1 small mine are assumed to possibly conduct personal exposure sampling. In both large and small mines it is assumed that the personal exposure sampling will be performed once annually, in order to show the need to comply to a different action level than that stated in paragraph (c). Personal exposure samples would usually be taken over a shift for a period of one working week. On average, large mines operate 2 shifts per day for 5 days per week, while small mines operate 1 shift per day for 4 days per week. Potential occupations that could be sampled are miner operator, miner helper, shuttle car operator, bolter operator, bolter helper, and some others may be needed in certain

situations. MSHA estimates that a large mine will on average sample about 8 people performing certain occupations and a small mine will on average sample about 3 people. After the shift is over, it is estimated to take not more than 1 minute (0.0167 hours) to obtain the CO and NO_2 readings. The value of labor is $26 per hour. The affected large mines that may perform personal exposure sampling will each need to purchase 5 additional instantaneous gas analyzers that provide multiple readings (costing $1,475 each), while the 1 affected small mine will need to purchase 2 additional such devices.

The initial compliance costs to purchase the additional equipment will be $10,325, of which large mines will account for $7,375 [5 devices x $1,475] and small mines will account for $2,950 [2 devices x $1,475]. The devices are estimated to last for 10 years, thus, the $10,325 is annualized over that period to be about $1,475. Of the $1,475, large mines will incur $1,050 [$7,375 x 0.142] and small mines will incur $425 [$2,950 x 0.142].

The annual compliance costs to perform the personal exposure sampling will be $200. Of the $200, large mines will account for $175 [(2 shifts x 5 days x 8 occupations) x (0.0167 x $26) x 5 mines] and the one small mine will account for not more than $25 [(1 shifts x 4 days x 3 occupations) x (0.0167 x $26) x 1 mine].

Section 70.1900(d) requires notice in existing recordkeeping requirements of § 75.363 when sampling results

exceed the action level. The § 75.363 record shall contain the: location where sample was collected; substance sampled and measured concentration and; corrective action taken.

MSHA estimates that during the year no more than 10 samples from 100 large mines and 10 samples from 10 small mines, that are required to be taken under paragraph (a), will show results that exceed the 50 percent level. It is estimated to take 10 minutes (0.1667 hours) in a large mine and 5 minutes (0.0833 hours) in a small mine, to make and maintain the record. For the 10 large mines and 2 small mines noted in paragraph (c) that must keep a record when they exceed the stated action level, MSHA estimates that records will cost $6,050 annually. Of the $6,050, large mines will incur $5,750 [(0.1667 hours x $34.50) x 10 samples x 100 mines] and small mines will incur $300 [(0.0833 hours x $34.50) x 10 samples x 10 mines].

Current Sampling

The sampling of diesel-powered equipment referenced in § 70.1900 will replace current sampling practices on such equipment. Thus, annual sampling costs derived in § 70.1900 is subtracted from the current estimated annual sampling costs pertaining to diesel equipment that will cease as a result of this rule, to arrive at the net effect of annual sampling cost to mine operators. As a result of the ventilation standards, sampling of diesel-powered equipment is currently taking place, however, such sampling is not uniform. Sampling practices can vary by district and mines even within the same district can

have different sampling practices. Permissible diesel face equipment may be sampled on every shift or at least once a day and nonpermissible equipment may be sampled every day or every two weeks.

For purposes of cost computation, it is assumed that currently diesel face equipment that is permissible is sampled on every shift and nonpermissible equipment is sampled once a week. Current sampling is performed by either an instantaneous gas analyzer device that provides multiple readings or one that provides a single reading. In addition, a small amount of mines may still use stain tubes to perform such sampling. It is assumed that current sampling of CO and NO_2, depending on the instrument used, can take between 1 to 4 minutes (for an average of 2.5 minutes or 0.0417 hours). With respect to diesel face equipment that is permissible it is estimated that large and small mines have 542 and 25 pieces, respectively. It is also estimated that nonpermissible pieces of diesel-powered equipment in large and small mines are 2,336 and 25, respectively.

Thus, the annual cost for current sampling is about $572,275, of which large mines will incur about $564,650 [542 perm. pieces x 2 shifts x 250 days x 0.0417 hrs. x $34.50] + [2,336 nonperm. pieces x 52 weeks x 0.0417 hrs. x $34.50] and small mines will incur about $7,625 [25 perm. pieces x 1 shift x 160 days x 0.0417 hrs. x $34.50] + [25 nonperm. pieces x 52 wks. x 0.0417 hrs. x $34.50]. These estimates associated with current sampling practices are lower bound when considering that:

nonpermissible equipment may be sampled more often; some mines may also sample certain working section locations in addition to sampling pieces of equipment; and that the cost of using stain tubes by some mines to perform the sampling is not included in the calculations. Since some mines are using instantaneous gas analyzers that provide for either single or multiple reading, while other mines are still using stain tubes; it has become difficult to determine how many pieces of diesel-powered equipment will be sampled by using stain tubes. When stain tubes are used costs can be high. A stain tube costs about $3.50 and generally at least 2 stain tubes are used when conducting sampling on a piece of equipment. Thus, the cost of using stain tubes can escalate quickly as the sampling frequency and number of pieces of diesel-powered equipment sampled increases. Even though the current sampling costs are likely to be higher than what has been estimated above, they are still lower than those determined in the 1989 proposal. In the 1989 proposal the current sampling costs were determined to be higher because of the assumption that all mines were using stain tubes for sampling.

Thus, when subtracting $431,650 of annual sampling compliance costs ($411,125 for large mines and $20,525 for small mines) derived in § 70.1900 paragraphs (a)(1), (a)(2), (a)(4), (b)(1), (b)(2), (c) and (d) from current annual sampling costs of $572,275 ($564,650 for large mines and $7,625 for small mines), the result is net savings in total annual sampling costs of

$140,625. Annual savings for large mines will be $153,525, while small mines will incur costs of $12,900. Such costs for small mines are lower and the savings for large mines will be higher when considering that some mines still use stain tubes to perform the required sampling.

Thus, the total initial costs for § 70.1900 will be about $570,100, of which large and small mines will incur about $533,950 and $36,150, respectively. The total annualized costs will be $80,975, of which large and small mines will incur about $75,825 and $5,150, respectively. When comparing costs to sample under the final rule with costs to sample under current practices, the final rule results in total net annual savings of $140,625, consisting of savings to large mines of $153,525, offset somewhat by costs to small mines of about $12,900.

Section 75.325 Air Quantity

This section will not result in cost to small mines, but will result in annual costs of $589,000 to large mines. There are no initial or annualized costs.

Section 75.325(f)(1) requires that the minimum air quantity for an individual unit of diesel-powered equipment be at least that specified on the approval plate for that equipment. Such air quantity shall be maintained in any working place where the equipment is being operated. There are no compliance costs for this provision because it is common practice for mines affected by this provision to have the air quantity specified on the

approval plate.

Section 75.325(f)(2) requires that the minimum air quantity for an individual unit of diesel-powered equipment be at least that specified on the approval plate for that equipment. Such air quantity shall be maintained at the section loading point during any shift the equipment is being operated on the working section. MSHA estimates that this provision will affect 6 large mines and no small mines. These 6 mines will need to increase air at the section loading point at each working section. MSHA estimates that there are 2 to 4 working sections (for an average of 3) per large mine. MSHA estimates that it will cost approximately $9,500 per year to increase the quantity of air by 10,000 cubic feet per minute (cfm). Thus, the annual costs for the 6 mines will be $171,000 [6 mines x 3 sections x $9,500].

Section 75.325(f)(3) requires that the minimum air quantity for an individual unit of diesel-powered equipment be at least that specified on the approval plate for that equipment. Such air quantity shall be maintained in any entry where the equipment is being operated outby the section loading point in areas of the mine developed on or after the effective date of the provision. In future mine development, approximately 41 large mines will need to make adjustments in their ventilation, such as reducing the number of common entries developed, on or after the effective date of this provision. There are no costs for this provision because mines will be able to adjust to this situation without any additional costs when developing future mine design.

Section 75.325(f)(4) requires that the minimum air quantity for an individual unit of diesel-powered equipment be at least that specified on the approval plate for that equipment. Such air quantity shall be maintained in any air course with single or multiple entries where the equipment is being operated outby the section loading point in areas of the mine developed prior to the effective date of this provision. There will be minimal costs because mines currently meet this ventilation quantity requirement in the outby areas.

Section 75.325(f)(5) requires that the minimum air quantity for an individual unit of diesel-powered equipment be at least that specified on the approval plate for that equipment. Such air quantity shall be maintained at any other location required by the district manager and specified in the approved ventilation plan. There are no costs estimated for this provision because it is difficult to determine if this situation will occur and if it does occur to what extent.

Section 75.325(g) requires minimum ventilating air quantity where multiple units of diesel-powered equipment are operated on working sections and in areas where mechanized mining equipment is being installed or removed must be at least the sum of that specified on the approval plates of all the diesel-powered equipment on the working section or in the area where mechanized mining equipment is being installed or removed. The minimum ventilating air quantity shall be specified in the approved ventilation plan. For working sections such air quantity must be

maintained: (1) in the last open crosscut of each set of entries or rooms in each working section; (2) in the intake, reaching the working face of each longwall; and (3) at the intake end of any pillar line.

Concerning permanent ventilation controls, this standard will not affect mines because such controls are already required by existing ventilation standards. Also, there will be no costs for mines using face haulage diesel-powered equipment, because it is current industry practice to have the air quantity stipulated by this provision available in the locations required by paragraphs (g)(1) through (g)(3).

However, with respect to air quantity requirements of this provision for the installation and removal of mechanized mining equipment required by paragraph (g) it is anticipated that an increase will be required. This provision will affect 44 large mines that currently use diesel-powered equipment for longwall set up and removal. MSHA estimates that it will cost approximately $9,500 per year to increase the quantity of air by 10,000 cubic feet per minute (cfm). Thus, the annual costs for the 44 mines will be $418,000 [44 mines x $9,500].

Section 75.325(h) sets forth the types of equipment that may be excluded in the calculations required by paragraph (g). There are no compliance costs for this provision.

Section 75.325(i) sets forth the conditions that must be followed if the mine operators choose to use minimum quantities of air that are different than those required by paragraph (g).

MSHA anticipates that this provision is not likely to be used by mine operators and thus has not estimated any compliance costs for this provision. Moreover, in those limited cases where this provision would be used it would be difficult to provide compliance costs for alternatives that would be mine specific.

Section 75.325(j) requires that if during sampling required by § 70.1900(c) the ventilating air is found to contain concentrations of carbon monoxide or nitrogen dioxide in excess of the action level specified in § 70.1900(c), higher action levels may be approved by the district manager based on the results of sampling that demonstrated that a higher action level will maintain continuous compliance with applicable TLV's. Action levels other than those specified in § 70.1900(c) shall be specified in the approved ventilation plan. The compliance costs for this provision was determined in § 70.1900(c) of this part IV analysis.

Amendments to Section 75.371

As a result of §§ 75.325 and 70.1900, the final rule amends § 75.371 to provide for the inclusion of additional information in the mine operators' ventilation plan. Specifically, the plan should include: (1) as required by § 75.325(d), (g), and (i), the minimum quantity of air that will be provided during the installation and removal of mechanized mining equipment, the location where this quantity will be provided, and the ventilation controls that will be used; (2) as required by

§ 70.1900(a)(4) areas designated by the district manager where measurements of carbon monoxide and nitrogen oxide concentrations will be made; (3) as required by § 75.325(f)(2) locations where the air quantity will be maintained at the section loading point; (4) as required by § 75.325(f)(5) any additional location(s) required by the district manager where a minimum air quantity must be maintained for an individual unit of diesel-powered equipment; (5) as required by § 75.325(g) and (i) the minimum air quantities that will be provided where multiple units of diesel-powered equipment are operated; (6) as required by § 75.325(h) the diesel-powered mining equipment excluded from the calculation under § 75.325(g); (7) as required by § 75.325(j), the action levels higher than 50 percent specified by § 70.1900(c).

All large and small mines are affected by this provision, however, MSHA estimates that compliance costs will be minimal. To record the information in the mine ventilation plan is estimated to take a large mines 20 minutes (0.3333 hours) and a small mine 10 minutes (0.1667 hours). Information will be recorded by a mine supervisor earning $37.35 per hour. The annual compliance costs will be $2,075, of which large mines will incur $1,975 [158 mines x (0.3333 hrs. x $37.35)] and small mines will incur less than $100 [15 mines x (0.1667 hrs. x $37.35)].

Section 75.1901 - Diesel Fuel Used to Operate Diesel-Powered Equipment Underground

Section 75.1901(a) requires that diesel-powered equipment operating underground use diesel fuel having a maximum sulfur

content of 0.05 percent and have a maximum flash point of 100 °F (38 °C). Currently, mines may be using either high sulfur or low sulfur fuel. MSHA contacted two oil company refineries concerning the price of low and high sulfur fuels. Both refineries noted that currently low sulfur fuel cost about 1.75 cents per gallon more than high sulfur fuel. However, this cost difference can diminish in different geographical regions due to supply and demand conditions. It could even be that in some regions the 1.75 cent price difference can reverse itself, such that, the price of high sulfur fuel may be slightly higher than low sulfur fuel. Based upon the slight difference between the price of high sulfur and low sulfur fuel and the impact on this difference in regards to supply and demand in different geographical regions of the country, MSHA does not believe that the compliance cost impact for switching from high sulfur to low sulfur fuel for the underground coal mining industry as a whole will be significant.

In addition, the mine operator shall provide to an authorized representative of the Secretary evidence that the diesel fuel purchased for use in diesel-powered equipment underground meets the requirements of Paragraph (a) of this section. Section 70.1900 of the proposal would have required the mine operator to certify that the sulfur content of the fuel was less than 0.25 percent; this certification would have provided the mine operator an alternative to having to conduct weekly area samples of sulfur dioxide (SO_2). The Agency believes that the

provision in the final rule is a more appropriate way to address the operator's obligation to verify the fuel's content and also less burdensome to the mine operator because it does not include any requirements for SO_2 sampling. A breakdown of the contents of the fuel should be easily available from the fuel supplier when the mine operator buys the fuel. MSHA estimates that about 50 percent of mine operators do not keep a copy of fuel purchase statements on file. Thus, 79 (158 x 0.5) large mines and 8 (15 x 0.5) small mines will incur filing costs. It is estimated that fuel will be purchased once every two weeks by large and small mines and that it will take a clerical person earning $10 per hour about 3 minutes (or 0.05 hours) to file the statement. Compliance costs relate to this provision will be minimal. Annual costs will be less than $1,100, of which large mine operators will incur less than $1,00 [79 mines x 25 wks. ($10 wage x 0.05)] and small mines will incur less than $100 [8 mines x 20 wks. x ($10 wage x 0.05)].

Section 75.1901(b) states that flammable liquids shall not be added to diesel fuel used in diesel-powered equipment underground. There are no compliance costs associated with this standard.

Section 75.1901(c) states that only designated fuel additives which have been registered by the Environmental Protection Agency may be used in diesel-powered equipment. The EPA has registered additives that are currently used or substitutes which are equivalent in price to those used. Thus,

there are no compliance costs associated with this standard.

Section 75.1902 - Underground Diesel Fuel Storage Facilities, General Requirements

This section concerns general requirements for underground diesel fuel storage facilities. The total initial year compliance costs will be $246,300, of which large mines will incur $232,350 and small mines will incur $13,950. The annualized compliance costs will be $39,725, of which large mines will incur $37,650 and small mines will incur $2,075. There are no annual compliance costs for this section.

Sections 75.1902(a) and (b) paragraph (a) require that all diesel fuel be stored in diesel fuel tanks or safety cans. Paragraph (b) requires that diesel fuel tanks in permanent underground diesel fuel storage facilities not have a total capacity exceeding 1,000 gallons.

With respect to diesel fuel tanks, MSHA assumes that there is one tank in each permanent underground diesel fuel storage facility and temporary diesel fuel storage area. Under the assumption that there is 1 underground temporary diesel fuel storage area for each section in a large and small mine, then in large mines there are 474 underground temporary diesel fuel storage areas (158 large mines x 3 sections per mine x 1 temporary storage area). One tank in each underground temporary diesel fuel storage area would mean that there are 474 tanks in large mines. In small mines there are 15 underground temporary diesel fuel storage areas (15 mines x

1 sections x 1 temporary storage area). One tank in each underground temporary diesel fuel storage area would mean that there are 15 tanks in small mines.

Concerning permanent underground diesel fuel storage facilities, there is one existing such facility in a large mine that is constructed similar to the requirements set forth in § 75.1903(a) of this rule. MSHA estimates that as a result of this rule 19 more permanent underground diesel fuel storage facilities in large mines and 5 in small mines will need to be constructed to comply with the provisions of § 75.1903(a). Thus, as a result of this rule there will be 20 permanent underground facilities in large mines and 5 permanent underground facilities in small mines. One tank in each facility would mean that there are 20 tanks in permanent underground facilities in large mines and 5 tanks in permanent underground facilities in small mines.

In total there are 494 (474 + 20) temporary underground diesel fuel storage areas and permanent underground diesel fuel storage facilities in large mines each containing one tank, for a total of 494 tanks. There are a total of 20 (15 + 5) temporary underground diesel fuel storage areas and permanent underground diesel fuel storage facilities in small mines each containing one tank, for a total of 20 tanks.

Some of the tanks will have to be replaced because they do not comply with § 75.1902(b), which requires that diesel fuel tanks in permanent underground diesel fuel storage facilities not have a total capacity exceeding 1,000 gallons. In addition, some

of the tanks will also have to be replaced because they do not comply with § 75.1904(a)(1) through (a)(4), which require that tanks have a minimum 3/16" thick steel wall or other metal with a wall thickness providing equivalent strength; be protected from corrosion; be of seamless construction or have liquid tight welded seams; and not leak.

MSHA estimates that operators owning about 50 percent of all diesel fuel tanks in large and small mines that are in underground temporary diesel fuel storage areas (237 in large mines and 8 in small mines) will have to purchase new tanks to come into compliance with § 75.1902(b) and/or § 75.1904(a)(1) through (a)(4). With respect to tanks in permanent underground diesel fuel storage facilities, 19 tanks in large mines and 5 tanks in small mines will need to be purchased. Thus, mine operators will have to purchase 256 (19 + 237) tanks in large mines and 13 (5 + 8) tanks in small mines. A tank in a temporary storage area generally holds between 300 to 500 gallons and purchase and installation costs are about $700. A tank in a permanent storage facility is larger than a tank in a temporary storage area and generally holds about 1,000 gallons and purchase and installation costs are about $1,100. Tanks in both permanent storage facilities and temporary storage areas are estimated to last at least 10 years.

Thus, the initial costs to comply with § 75.1902(b) and/or § 75.1904(a)(1) through (a)(4) will be about $200,000, of which large mines will incur $186,800 [(19 tanks in permanent storage

facilities x $1,100) + (237 tanks in temporary storage areas x $700)]; and small mines will incur $13,200 [(5 tanks in permanent storage facilities x $1,100) + (8 tanks in temporary storage areas x $700)]. The $200,000 was annualized over a 10 year period to be about $28,400, of which large mines will incur $26,525 ($186,800 x 0.142) and small mines will incur $1,875 ($13,200 x 0.142).

The remaining compliance costs for diesel fuel tanks associated with the rest of § 75.1904 through § 75.1906 is for retrofitting all existing and new tanks with certain features and will be determined in those sections.

With respect to safety cans, paragraph (a) requires that if diesel fuel is not stored in a diesel fuel tank then it must be stored in a safety can. Section 75.1904(f) requires that safety cans be: 1) metal and limited to 5 gallons or less; 2) equipped with a flexible or rigid tubular nozzle attached to a valved spout; 3) provided with a vent valve designed to open and close simultaneously and automatically with the opening and closing of the pouring valve; and 4) designed so that it will safely relieve internal pressure when subjected to fire exposure.

A safety can that meets the provisions of § 75.1904(f) is estimated to cost $50 and have a life of at least 5 years. MSHA estimates that 95 percent of the existing diesel-powered machines are affected by this rule. Of that 95 percent 1 new safety can will need to be purchased for every three machines. Thus, with respect to large mines, about 911 safety cans will need to be

purchased for the 2,878 diesel-powered machines in large mines [(2,878 x 0.95) / 3]. With respect to small mines, about 16 safety cans will need to be purchased for the 50 diesel-powered machines in small mines [(50 x 0.95) / 3].

The initial year compliance costs for mine operators to purchase safety cans will be about $46,300, of which large mines will incur $45,550 [$50 x ((2,878 pieces / 3) x 0.95)] and small mines will incur $750 [$50 x ((50 pieces / 3) x 0.95)]. The initial year compliance costs were annualized over a 5 year period to be about $11,325, of which large mines will incur $11,125 [$45,550 x 0.244] and small mines will incur $200 [$750 x 0.244].

Sections 75.1902(c)(1) through (c)(3)) set forth requirements concerning placement of underground temporary diesel storage areas in a mine and conditions for safe operation. There are no compliance costs for these standards because such requirements are normal work practices or would involve a change in work practices.

Sections 75.1902(d) and (e) require underground permanent diesel fuel storage facilities and temporary diesel fuel storage areas to be located: (1) at least 100 feet from shafts, slopes, shops, and explosives magazines; (2) at least 25 feet from trolley wires, power cables, and electric equipment not necessary for operation of a storage facility; and (3) in a location that is protected from damage by other mobile equipment; and paragraph (e) states that permanent underground diesel fuel

storage facilities must not be located within the primary escapeway. Existing underground permanent diesel fuel storage facilities and temporary diesel fuel storage areas are either: in compliance; or if not in compliance a change in work practices involving minimal costs would be required.

Section 75.1903 - Diesel Fuel Storage Facilities; Construction and Safety Precautions

In this section total initial year compliance costs will be $294,900, of which large mines will incur $249,575 and small mines will incur $45,325. The total annualized compliance costs will be $51,575, of which large mines will incur $44,750 and small mines will incur $6,825. The total annual compliance costs will be $17,075, of which large mines will incur $13,525 and small mines will incur $3,550.

Sections 75.1903(a)(1) through (a)(7) require that underground permanent diesel fuel storage facilities be: 1) constructed of noncombustible materials; 2) provided with a self-closing door or a means for automatic enclosure; 3) provided with a means for personnel to enter and exit the facility after closure; 4) ventilated with intake air coursed directly into the return air course, or directly to the surface without passing a working section, using ventilation controls meeting the requirements of § 75.333(e); 5) equipped with an automatic fire suppression system which meets the requirements of § 75.1912; 6) provided with a means of containment capable of holding 150 percent of the maximum capacity of the fuel storage system;

and 7) provided with a competent concrete floor or equivalent to prevent fuel spills from saturating the mine floor.

As noted in § 75.1902(a) MSHA estimated 20 underground permanent diesel fuel storage facilities in large mines and 5 such facilities in small mines. Of the 20 permanent storage facilities in large mines, 1 is in compliance with § 75.1903(a)(1) through (7). MSHA estimates that 19 underground permanent diesel fuel storage facilities in large mines and 5 in small mines need to be constructed in accordance with paragraphs (a)(1) through (a)(7). With the exception of an automatic fire suppression system, construction costs for an underground permanent diesel fuel storage facility pursuant to § 75.1903(a) are: 1) $825 for the cost to coat approximately 600 square feet of the storage structure with a fire resistant sealant costing about $1.37 per square foot; 2) $1,625 for the cost of self closing doors; 3) $250 for the cost of another door that functions as a means for personnel to enter and exit the facility after closure; 4) $250 for costs concerning a regulator in order for the structure to meet the ventilation requirements noted in paragraph (a)(4); 5) about $225 for the cost of concrete (at $75 per yard of concrete) that is needed to construct a [(15' x 20' x .25')/27 ft^3/yd]' cement floor; and 6) approximately $1,250 of labor costs to build the structure which consist of 24 hours of labor by two persons ($26 per hr. x 24 hrs. x 2 persons). Thus, the construction cost for an underground permanent diesel fuel storage facility is $4,450 ($825 + $1,650 +

$250 + $250 + $225 + $1,250). The structure is estimated to last at least 10 years. In addition to the above costs, it is estimated that about 1 hour per month will be spent on performing annual maintenance, such as, cleaning up fuel spills or applying rock dust.

Thus, the initial year compliance costs to construct underground permanent diesel fuel storage facilities will be about $106,800, of which large mines will incur $84,550 [19 permanent storage facilities x ($825 + $1,650 + $250 + $250 + $225 + $1,250)]; and small mines will incur $22,250 [5 permanent storage facilities x ($825 + $1,650 + $250 + $250 + $225 + $1,250)]. The initial year cost was annualized over a 10 year period to be about $15,150, of which large mines will incur $12,000 [$84,550 x 0.142] and small mines will incur about $3,150 [$22,250 x 0.142]. Annual maintenance will be about $7,475, of which large mines will incur $5,925 [19 permanent storage facilities x (1 hr. x 12 mos. x $26 per hr.)] and small mines will incur $1,550 [5 permanent storage facilities x (1 hr. x 12 mos. x $26 per hr.)].

Paragraph (a)(5) requires that each underground permanent diesel fuel storage facility be equipped with an automatic fire suppression system which meets the requirements of § 75.1912 of this rule. One distributor of fire suppression systems stated that an automatic system could cost as much as $4,875 for a two tank system. Another distributor stated that an automatic two tank fire suppression system could cost $2,800. MSHA used the

average of $3,850 for the cost to purchase and install a two tank automatic fire suppression system in an underground permanent diesel fuel storage facility. The automatic fire suppression system is estimated to last the life of the facility and annual maintenance costs are estimated to be 10 percent of the original price of the unit or about $400 ($3,875 x 0.10).

The initial year compliance costs to purchase and install automatic fire suppression systems on underground permanent diesel fuel storage facilities will be about $93,000, of which large mines will incur $73,625 (19 permanent storage facilities x $3,875) and small mines will incur $19,375 (5 permanent storage facilities x $3,875). The initial year costs were annualized over 10 years to be about $13,200, of which large mines will incur $10,450 ($73,625 x 0.142) and small mines will incur $2,750 ($19,375 x 0.142). Annual maintenance costs will be about $9,600, of which large mines will incur $7,600 (19 permanent storage facilities x $400) and small mines will incur $2,000 (5 permanent storage facilities x $400).

Sections 75.1903(b)(1) and (2) require that underground permanent diesel fuel storage facilities and temporary diesel fuel storage areas be equipped with at least 240 pounds of rock dust and two portable multipurpose dry chemical type (ABC) fire extinguishers. Rock dust costs $33 per ton delivered or approximately $0.02 per pound, thus, the cost for 240 pounds of rock dust is about $5. A 20 pound fire extinguisher meeting the requirements of this standard will cost about $90. All

underground permanent diesel fuel storage facilities and temporary diesel fuel storage areas in § 75.1902(a) will need rock dust and two fire extinguishers. All 494 underground storage diesel fuel facilities and areas (474 temporary + 20 permanent) in large mines and 20 such facilities (15 temporary + 5 permanent) in small mines will need the required amount of rock dust and two fire extinguishers.

The initial year compliance cost to equip underground permanent diesel fuel storage facilities and temporary diesel fuel storage areas with rock dust will be about $2,575, of which large mines will incur $2,475 [$5 x (20 permanent storage facilities + 474 temporary storage facilities)] and small mines will incur $100 [$5 x (5 permanent storage facilities + 15 temporary storage facilities)]. The $2,575 was annualized over a 5 year period to be about $625, of which large mines will incur $600 [$2,475 x 0.244] and small mines will incur $25 [$100 x 0.244].

The initial year compliance cost to equip underground permanent diesel fuel storage facilities and temporary diesel fuel storage areas with fire extinguishers will be about $92,525, of which large mines will incur $88,925 [(20 permanent storage facilities + 474 temporary storage areas) x ($90 x 2 fire extinguishers)]; small mines will incur $3,600 [(5 permanent storage facilities + 15 temporary storage facilities) x ($90 x 2 fire extinguishers)]. The $92,525 was annualized over a 5 year period to be about $22,600, of which large mines will incur

$21,700 [$88,925 x 0.244] and small mines will incur $900 [$3,600 x 0.244].

Section 75.1903(b)(3) requires that underground permanent diesel fuel storage facilities and temporary diesel fuel storage areas be identified with conspicuous markings designating the structure as a diesel fuel storage facility or area. This would require less than 2 minutes (0.0333 hours) of labor, at a wage rate of $26 per hour, in order to mark the facility with spray paint. This affects 494 underground permanent diesel fuel storage facilities and temporary diesel fuel storage areas in large mines and 20 such facilities in small mines. The initial compliance costs will be about $450, of which large mines will incur $425 [494 facilities and areas x (0.0333 hrs. x $26 wage)], and small mines will incur $25 [20 facilities and areas x (0.0333 hrs. x $26 wage)]. The $450 was annualized over a 2 year period to be less than $275, of which large mines will incur $250 [$450 x 0.553] and small mines will incur less than $25 [$25 x 0.553]. The compliance costs associated with this standard are minimal.

Section 75.1903(b)(4) requires that underground permanent diesel fuel storage facilities and temporary diesel fuel storage areas be maintained as to prevent the accumulation of water. There are no compliance costs for this provision because the requirement is a standard work practice.

Sections 75.1903(c) and (d) set forth conditions to be followed when welding or cutting storage facilities or areas,

tanks, pipelines, and other containers that may have contained diesel fuel. Existing work practices in mines are consistent with these conditions and therefore, there are no compliance cost associated with the provisions.

Section 75.1904 - Underground Diesel Fuel Tanks and Safety Cans

In this section total initial year compliance costs will be $228,550, of which large mines will incur $218,300 and small mines will incur $10,250. The total annualized compliance costs will be $32,750, of which large mines will incur $31,225 and small mines will incur $1,525. There are no annual compliance costs in this section.

Sections 75.1904(a)(1) through (a)(4) require that diesel fuel tanks: 1) have a minimum 3/16" thick steel wall or other metal with a wall thickness providing equivalent strength; 2) be protected from corrosion; 3) be of seamless construction or have liquid tight welded seams; and 4) not leak. These compliance costs were determined in § 75.1902(a).

Section 75.1904(a)(5) requires that tanks in underground permanent diesel fuel storage facilities be placed on noncombustible supports so that they are at least 12" above the floor. This provision applies to 20 tanks in large mines and 5 tanks in small mines. The support structure required could be built with cinder blocks which would involve minimal cost to construct, or it could cost as much as $500 if a steel metal frame support structure was constructed and coated with sealant.

MSHA estimates the average of these two alternatives, $250, as an average cost, including labor, for the construction of a support structure. This structure will last at least 10 years.

The initial year compliance cost for the support structure will be about $6,250, of which large mines will incur $5,000 [20 permanent storage facilities x $250] and small mines will incur $1,250 [5 permanent storage facilities x $250]. The initial year cost of $6,250 was annualized over 10 years to be about $925, of which large mines will incur $725 [$5,000 x 0.142] and small mines will incur $200 [$1,250 x 0.142].

Sections 75.1904(b)(1)(i) and (ii) require devices for emergency venting that are designed to open at a pressure not to exceed 2.5 psi according to the size of the tank. The cost of the emergency device for a tank in paragraph (ii) (one that holds less than 300 gallons) is about $125. The cost of the emergency device for a tank in paragraph (i) (one that holds more than 300 gallons) is about $205. It will take about 1 hour of labor valued at $26 per hour to install the devices for emergency venting and the devices will last the life of the tank. The tanks in underground permanent diesel fuel storage facilities (20 in large mines and 5 in small mines) hold more than 300 gallons. The tanks in underground temporary diesel fuel storage areas (474 in large mines and 15 in small mines) generally hold less than or equal to 300 gallons.

Thus, the initial year compliance costs to purchase and install devices for emergency venting will be about $79,625, of

which large mines will incur $76,200 [(20 tanks in permanent storage facilities x ($205 + $26)) + (474 tanks in temporary storage areas x ($125 + $26))] and small mines will incur $3,425 [(5 tanks in permanent facilities x ($205 + $26)) + (15 tanks in temporary storage areas x ($125 + $26))]. The $79,625 was annualized over a 10 year period to be about $11,325, of which large mines will incur $10,825 [$76,200 x 0.142] and small mines will incur $500 [$3,425 x 0.142].

Section 75.1904(b)(2) requires a tethered or self closing cap for stationary tanks in underground permanent diesel fuel storage facilities. This provision will affect 20 tanks in large mines and 5 tanks in small mines that are in underground permanent diesel fuel storage facilities. In addition, the standard also requires self closing caps for diesel fuel tanks on diesel fuel transportation units. Each tank in an underground temporary diesel fuel storage area rests upon a trailer or a self-propelled diesel fuel transportation unit. Thus, 474 tanks in large mines and 15 tanks in small mines are also affected by this provision. MSHA assumes that mines will purchase a self closing cap which cost about $43 and lasts the life of the tank. Also, based upon a labor rate of $26 per hour and 15 minutes of labor time needed to install the device, the cost of labor will be $6.50.

Thus, the initial year compliance costs to install self-closing caps on tanks in temporary storage areas will be about $25,450, of which large mines will incur $24,450 [(20 tanks in

permanent facilities + 474 tanks in temporary areas) x ($43 + $6.50)] and small mines will incur $1,000 [(5 tanks in permanent facilities + 15 tanks in temporary areas) x ($43 + $6.50)]. The $25,450 was annualized over a 10 year period to be about $3,625, of which large mines will incur $3,475 [$24,450 x 0.142] and small mines will incur $150 [$1,000 x 0.142].

Section 75.1904(b)(3) requires that all diesel fuel tanks be provided with vents to permit the free discharge of liquid, at least as large as the fill or withdrawal connection, whichever is larger, but not less than 1 1/4" nominal inside diameter. A normal 1.5" vent, costing about $12, will need to be purchased by mines and installed on tanks in order to satisfy this requirement. The vent device will last the life of the tank and will need to be installed on all tanks in underground permanent storage facilities and temporary storage areas. Based upon a labor rate of $26 per hour and 15 minutes of labor time needed to install the device, the cost of labor will be $6.50.

The initial year compliance costs to install the vent device on all tanks will be about $9,525, of which large mines will incur $9,150 [(20 tanks in permanent storage facilities + 474 tanks in temporary storage areas) x ($12 + $6.50)] and small mines will incur $375 [(5 tanks in permanent storage facilities + 15 tanks in temporary storage areas) x ($12 + $6.50)]. The $9,525 was annualized over a 10 year period to be about $1,350, of which large mines will incur $1,300 [$9,150 x 0.142] and small mines will incur $50 [$375 x 0.142].

Sections 75.1904(b)(4)(i) and (ii) require that all diesel fuel tank connections be identified by conspicuous markings that specify the function and are closed when not in use. In order to satisfy this requirement mines can mark with spray paint on the side of each tank. This procedure would not take more than 2 minutes of labor, at a wage rate of $26 per hour. The initial compliance costs will be about $450, of which large mines will incur $425 [494 tanks x (0.0333 hrs. x $26 wage)] and small mines will incur $25 [20 tanks x (0.0333 hrs. x $26 wage)]. The $450 was annualized over a 2 year period to be less than $275, of which large mines will incur about $250 [$450 x 0.553] and small mines will incur less than $25 [$25 x 0.553].

Sections 75.1904(b)(5) and (6) require that all diesel fuel tanks vent pipes drain toward the tank without sagging and be higher than the fill pipe opening. Also, tanks must have shutoff valves located as close as possible to the tank shell on each connection through which liquid can normally flow. These requirements are normally met when installing tanks and thus there are no compliance costs associated with these sections.

Section 75.1904(b)(7) requires that all diesel fuel tanks have an automatic closing, heat actuated valve on withdrawal connections below the liquid level. Depending upon the design, the cost for a heat actuated valve can range from $39 to $355. MSHA estimates the average of these two prices, about $200, as the cost for such a device. The heat actuated valve will need to be installed on all tanks and will last the life of the tank.

Based upon a labor rate of $26 per hour and 20 minutes of labor time needed to install the device, the cost of labor will be $8.66.

The initial year compliance costs to install the heat actuating devices on all tanks will be about $107,250, of which large mines will incur $103,075 [(20 tanks in permanent storage facilities + 474 tanks in temporary storage areas) x ($200 + $8.66)] and small mines will incur $4,175 [(5 tanks in permanent storage facilities + 15 tanks in temporary storage areas) x ($200 + $8.66)]. The $107,250 was annualized over a 10 year period to be about $15,250, of which large mines will incur $14,650 [$103,075 x 0.142] and small mines will incur $600 [$4,175 x 0.142].

Section 75.1904(c) requires that when tanks are provided with openings for manual gauging, tethered or self closing caps or covers must be provided and closed when not open for gauging. Openings for manual gauging are optional and are not required by this provision. It is not expected that many mines will provide tanks with openings for manual gauging. The compliance costs associated with this provision are minimal.

Section 75.1904(d) requires that the surfaces of all tanks and their associated components be protected against damage by collision. In many cases it is a normal work practice to protect the surfaces of tanks and components or to place components in positions where they are protected from damage. Thus, there are no compliance costs estimated for this standard.

Section 75.1904(e) requires that before filling tanks that are initially placed into service with diesel fuel, the tanks and their associated components must be tested for leakage at a pressure equal to the working pressure. This is a normal work practice that is accomplished by filling the tanks with water and checking for leakage. There are no associated compliance costs with this standard.

Section 75.1904(f) requires that safety cans must be: (1) metal and limited to nominal 5 gallons or less; (2) equipped with a flexible or rigid tubular nozzle attached to a valved spout; (3) provided with a vent valve designed to open and close simultaneously and automatically with the opening and closing of the pouring valve; and (4) designed so that it will safely relieve internal pressure when subjected to fire exposure. The compliance costs for this standard was determined in § 75.1902(a).

Section 75.1905 Dispensing of Diesel Fuel

The total initial years compliance costs will be $16,875, of which large mines will incur $16,200 and small mines will incur $675. The total annualized compliance costs will be $2,400, of which large mines will incur $2,300 and small mines will incur $100. There are no annual compliance costs for this section.

Sections 75.1905(a) through (b)(3) require that diesel fuel be dispensed from tanks by means of either: 1) gravity feed with a hose equipped with a nozzle with a self closing valve without a

latch open device; 2) a manual pump with a hose equipped with a nozzle containing a self closing valve; 3) a powered pump with an accessible emergency shutoff switch for each nozzle, a hose equipped with a self closing valve without a latch open device, and an anti-siphoning device. In all three methods noted above a self closing valve is required with the method used. Although, mines currently use one of the three methods noted above to transfer diesel fuel from tanks to vehicles, in about 90 percent of the cases self closing valves are not used. Therefore, the compliance costs associated with this standard will be for equipping either a gravity feed hose, a manual pump, or a powered pump with a self closing valve. MSHA assumes that each tank has its own transfer device, either a gravity feed hose, a manual pump, or a powered pump. Thus, of the 494 tanks in large mines and 20 tanks in small mines about 444 tanks (494 x 0.90) in large mines and 18 tanks (20 x 0.90) in small mines will need to equip their transfer device with a self closing valve. The cost for a self closing valve is about $30. The device is expected to last the life of the tanks. Based upon a labor cost of $26 per hour and 15 minutes to install the self closing valve, labor costs are estimated to be $6.50.

The initial year compliance costs for equipping transfer devices with a self closing valve will be about $16,875, of which large mines will incur $16,200 [($30 + $6.50) x 444 transfer devices] and small mines will incur $675 [($30 + $6.50) x 18 transfer devices]. The initial year cost of $16,875 was

annualized over 10 years to be about $2,400, of which large mines will incur $2,300 [$16,875 x 0.142] and small mines will incur $100 [$675 x 0.142].

In addition, MSHA estimates that 1 large mine will have to add additional emergency shut off switches and an anti-siphoning device to its existing diesel fuel piping system. The estimated cost to purchase an anti-siphoning device is about $500 and the cost for four emergency shut off switches are about $200 ($50 each). It is estimated to take about one and a half hours to install the anti-siphoning device and the emergency shut off switches, at a labor rate of $26 per hour. Both the anti-siphoning device and emergency shut off switches are estimated to last for 10 years. The initial costs for the large mine will be about $600 [(1 mines x $550 equipment) + (1 mine x 1.5 hrs. x $26 wage)]. The $600 was annualized over a ten year period to be less than $100 [$600 x 0.142]. The costs to the mining industry concerning these devices are minimal.

Sections 75.1905(c) and (d) require that diesel fuel not be dispensed by using compressed gas or to the fuel tank of diesel-powered equipment while the engine of the machine is running. These work practices do not involve any compliance costs to implement. Thus, there are no compliance costs associated with these provisions.

Section 75.1905(e) requires that powered pumps be shut off when fuel is not being dispensed. This is a work practice and there is no complliance costs.

Section 75.1905-1 Diesel Fuel Piping Systems

This section sets forth requirements concerning the design of diesel fuel piping systems. There are no compliance costs for this section because the one existing diesel fuel piping system from the surface is believed to be in compliance with the requirements of this section.

Section 75.1906 Transport of Diesel Fuel

With respect to § 75.1906, the total initial year compliance cost will be $1,032,050, of which large mines will incur $1,002,900 and small mines will incur $29,150. The total annualized compliance costs will be $173,500, of which large and small mines will incur $168,750 and $4,750, respectively. The total annual compliance costs will be $78,325, of which large mines will incur $75,925 and small mines will incur $2,400.

Sections 75.1906(a) through (d) require that diesel fuel be transported only by diesel fuel transportation units or in safety cans. No more than one safety can, conspicuously marked, secured, and protected from damage can be transported on a vehicle at any time. Safety cans must be stored in underground permanent diesel fuel storage facilities and safety cans that leak must be removed from the mine. In addition, tanks on diesel fuel transportation units and safety cans must be conspicuously marked as containing diesel fuel.

Mine operators will need to purchase equipment to fulfill the requirement in paragraph (a) that diesel fuel be transported

in diesel fuel transportation units. MSHA estimated a total of 489 tanks (474 in large mines and 15 in small mines) in temporary fuel storage areas. These tanks will be placed upon diesel fuel transportation units. Mine operators will likely purchase a two wheeled trailer type vehicle to use as a diesel fuel transportation unit. Large mine operators will purchase 474 units and small mine operators will purchase 15 units, at a cost of $800 per unit. The cost to purchase the equipment will be about $391,200, of which large mines will incur $379,200 [474 units x $800] and small mines will incur $12,000 [15 units x $800]. The vehicles are expected to last 10 years and thus are annualized over a 10 year period to be about $55,575, of which large mines will incur $53,850 [$379,200 x 0.142] and small mines will incur $1,725 [$12,000 x 0.142]. Annual maintenance costs for the equipment are estimated to be 10 percent of the original purchase price or $80. Thus, the annual maintenance costs associated with the equipment will be $39,125, of which large mines will incur $37,925 [474 units x $80] and small mines will incur $1,200 [15 units x $80].

The requirements in paragraphs (b) and (c) are work practices, such that, minimal or no compliance costs are associated with them. With respect to paragraph (d) and marking safety cans, safety cans that are purchased as a result of this rule will generally contain markings that meet the requirements of this section. Thus, there are no compliance costs related to marking such cans. Concerning the marking of diesel fuel

transportation unit tanks it is estimated to take 2 minutes (0.0333 hours) to mark with spray paint, at a labor rate of $26 per hour. MSHA estimates that 474 unit tanks in large mines and 15 unit tanks in small mines will require marking. The initial compliance costs will be $425, of which large mines will incur $400 [474 unit tanks x (0.0333 hrs. x $26 wage)] and small mines will incur less than $25 [15 unit tanks x (0/0333 hrs. x $26 wage)]. The $425 was annualized over a two year period to be less than $250, of which large mines will incur $225 [$400 x 0.553] and small mines will incur less than $25 [$25 x 0.553]. The compliance costs in paragraph (d) are also minimal.

Sections 75.1906(e) and (f) require that diesel fuel transportation units have no more than one tank, not exceeding 500 gallons capacity, permanently fixed to the transportation unit for the transport of diesel fuel. This is a work practice and no compliance costs are associated with this provision.

Section 75.1906(g) requires that if provided with electrical components, nonself-propelled diesel fuel transportation units parked in temporary diesel fuel storage areas must be provided with an automatic fire suppression device which meets the requirements of § 75.1107-3 through 75.1107-6 and §§ 75.1107-8 and 75.1107-16. MSHA estimates that, in both large and small mines, a small percentage (about 20 percent) of the diesel fuel transportation units parked in underground temporary diesel fuel storage areas are provided with electrical components and will need to be retrofitted with an automatic fire suppression system

meeting the requirements of § 75.1911. In large mines there are 474 diesel fuel transportation units. Thus, about 95 (474 x 0.20) units in large mines are affected by this provision. Of the 15 diesel fuel transportation units in small mines none are self-propelled. Thus, 3 units in small mines [15 x 0.20] are affected by this standard.

As noted in § 75.1903(a)(5), the cost for retrofitting a unit with a two tank automatic fire suppression system will be between $4,875 and $2,800. MSHA estimates that the cost to retrofit the unit with an automatic fire suppression system will be the average of the two prices, $3,850. The automatic fire suppression system will last the life of the equipment. Annual maintenance cost will be about 10 percent of initial equipment expenditures or about $400 ($3,850 x .10)

The initial year compliance costs to retrofit the affected units with an automatic fire suppression system will be about $377,300, of which large mines will incur $365,750 [95 units x $3,850] and small mines will incur $11,550 [3 units x $3,850]. The initial year costs of $377,300 was annualized over a 10 year period to be about $53,600, of which large mines will incur $51,950 [$365,750 x 0.142] and small mines will incur $1,650 [$11,550 x 0.142]. The annual maintenance costs will be about $39,200, of which large mines will incur $38,000 [95 units x $400] and small mines will incur $1,200 [3 units x $400].

Section 75.1906(h) requires that diesel fuel transportation units and vehicles transporting safety cans containing diesel

fuel must have at least two, multipurpose, dry chemical type (ABC) fire extinguishers. Currently, 30 CFR subpart L, § 75.1100-1 defines a portable fire extinguisher as being multipurpose and containing a nominal charge of 5 pounds of dry powder. The final rule requires two minimum 10A:60B:C multipurpose extinguishers. Units rated as 10A:60B:C typically contain a nominal 16 to 21 pounds of multipurpose dry chemical. Thus, although some existing diesel fuel transportation units and vehicles that transport safety cans may currently carry a fire extinguisher they probably do not comply with the fire extinguishers required by paragraph (g). With respect to mobile diesel fuel transportation units, 474 such pieces in large mines and 15 such pieces in small mines will need to purchase fire extinguishers. With respect to vehicles that can possibly carry safety cans, in 75.1902(a) it was estimated that one out of every three vehicles in large and small mines will carry a safety can. Thus, of the 2,878 vehicles in large mines 1/3 (or 959) will probably transport a safety can. Of the 50 vehicles in small mines, 1/3 (or 16) may possibly transport a safety can. Thus, the pieces of equipment that will need two fire extinguishers each will be 1,433 pieces (474 + 959) in large mines and 31 pieces (15 + 16) in small mines.

A 20 pound fire extinguisher meeting the requirements of this provision will cost about $90 and, on average, have a life of about 5 years. Thus, the initial year compliance cost for purchasing fire extinguishers will be about $263,550, of which

large mines will incur $257,950 [(474 + 959) x ($90 x 2 fire extinguishers)] and small mines will incur $5,600 [(15 + 16) x ($90 x 2 fire extinguishers)]. The initial year costs were annualized over a 5 year period to be about $64,325, of which large mines will incur $62,950 [$257,950 x 0.244] and small mines will incur $1,375 [$5,600 x 0.244].

Sections 75.1906(i), (j) and (k) require that: when not in use, diesel fuel transportation units must be parked in an underground diesel fuel storage facility or area; the requirements of § 75.1003-2 must be followed when the distance between a diesel fuel transportation unit and an energized trolley wire at any location is less than 12 inches; and diesel fuel cannot be transported on or with mantrips or on conveyor belts. These requirements are work practices that involve minimal or no compliance costs to implement. Thus, no compliance costs have been determined for these provisions.

Section 75.1907 - Diesel-powered Equipment Intended for Use in Underground Coal Mines

The initial compliance costs will be $7.0 million, of which large and small mines will incur $6.9 million and $114,350, respectively. The annualized compliance costs will be $1.6 million, of which large and small mines will incur $1.57 million and $20,225, respectively. The annual compliance cost will be $13,675, of which large mines will incur $13,175 and small mines will incur $500.

Section 75.1907(a) requires that all diesel-powered

equipment used where permissible electrical equipment is required, must be approved under part 36 of this title. All existing permissible diesel-powered equipment is approved under part 36. Thus, there is no compliance costs associated with this section.

Section 75.1907(b)(1) requires that diesel-powered equipment approved under part 36 must have a safety component system that limits surface temperatures to those specified in Subpart F of part 7. All existing diesel-powered equipment approved under part 36 have safety component systems that meet the requirements in Subpart F concerning surface temperatures. Thus, there are no compliance costs associated with this section.

Section 75.1907(b)(2) requires that non-limited class permissible diesel-powered equipment have an automatic or manual fire suppression system which meets the requirements of § 75.1911. MSHA estimates that about 95 percent of existing permissible diesel-powered equipment is equipped with an automatic or manual fire suppression system. Thus, 5 percent of 567 permissible equipment (or 28 pieces) have no fire suppression system. Of these 28 pieces, 27 pieces are in large mines and 1 piece is in a small mine. MSHA assumes that all 28 pieces will be fitted with an automatic fire suppression system. Fire suppression systems installed on machines can have either one or two tanks that hold the fire suppression material. Heavy duty equipment will need a two tank system. The purchase and installation cost of an automatic fire suppression system for

heavy duty equipment is estimated to be about $4,875 for a two tank system.

The initial compliance costs to place an automatic fire suppression system on permissible heavy duty equipment will be $136,500, of which large mines will incur $131,625 [27 pieces x $4,875] and small mines will incur $4,875 [1 piece x $4,875]. The initial costs were annualized over a 10 year period to be about $19,400, of which large mines will incur $18,700 [$131,625 x 0.142] and small mines will incur $700 [$4,875 x 0.142]. The annual compliance costs are estimated to be 10 percent of the original purchase and installation price. The total annual compliance costs will be $13,675, of which large mines will incur $13,175 [27 pieces x $4,875 x 0.1] and small mines will incur $500 [1 piece x $4,875 x 0.10].

Section 75.1907(b)(3) requires that permissible equipment will have brake systems that meet the requirements of § 75.1909 (b)(6), through (b)(8), (c), (d) and (e). The cost for this requirement as it concerns permissible equipment was determined in § 75.1909.

Section 75.1907(b)(4) requires that diesel-powered equipment used where permissible electrical equipment is required must have a particulate index and dilution air quantity determined in accordance with part 7, subpart E of this title.

The type of engines that are primarily affected by this are part of the inby face equipment that is currently approved under part 36. MSHA believes that this type of equipment significantly

affects the air quality. There are only four (4) engine models used in the face equipment. MSHA stated in the proposed rule preamble and restated in this final rule preamble that it is the Agency's intent to develop programs to establish dilution air quantities and particulate indices for these engines in accordance with part 7, subpart E.

The gaseous ventilation rates will be recalculated by MSHA for these engines from the data that MSHA has collected from the original certification tests under part 36. This information will be made available to the mine operators. MSHA will sponsor a program to have these four (4) engines tested in order to determine a particulate index for each engine. The particulate indices will be made available to the mine operators. MSHA plans to have the particulate index tests performed at no cost to the engine manufacturer or to the mine operator. Therefore, this section adds no compliance costs to the rule for mine operators or manufacturers.

Section 75.1907(b)(5) requires that permissible diesel-powered equipment used in underground coal mines incorporate a power package approved in accordance with part 7, subpart F. The cost for a power package approval was determined in part 7, subpart F, of this part IV analysis.

Section 75.1907(c) requires that nonpermissible machines must have a part 7, subpart E, engine. This provision affects 676 pieces of equipment, of which 517 pieces are nonpermissible self-propelled heavy duty equipment and 159 pieces are

nonpermissible nonself-propelled equipment. Of the 676 pieces, 662 pieces are in large mines and 14 pieces are in small mines. In meeting the requirements of this section, the mine operators will likely choose one of two options: 1) to retrofit an existing machine by buying a new engine or; 2) to retrofit an existing machine by making modifications to the existing machine's engine. MSHA estimates that both large and small mines will choose to retrofit their equipment by buying a new engine (option one) for 25 percent of their equipment, 166 engines in large mines (662 x 0.25) and 4 engines in small mines (14 x 0.25).

The cost of a new engine meeting a part 7, subpart E, approval could range from $3,175 for an 80 horsepower engine to $13,300 for a 150 horsepower engine. Thus, on average the cost of an engine will be about $8,250. The life of the engine is estimated at 10 years. It is estimated to take 80 hours (2 persons working 40 hours each) to install a new engine in an existing machine at a labor rate of $26 per hour.

The initial compliance costs for retrofitting an existing machine by buying a new engine will be about $1,756,100, of which large mines will incur $1,714,775 [166 pieces x ($8,250 + (80 hrs. x $26 wage))] and small mines will incur $41,325 [4 pieces x ($8,250 + (80 hrs. x $26 wage))]. The initial costs were annualized over 10 years to be about $249,375, of which large mines will incur $243,500 [$1,714,775 x 0.142] and small mines will incur $5,875 [$41,325 x 0.142]. The annual compliance costs will be about $168,525, of which large mines will incur $165,850

[62 pieces x ($1,850 + $825)] and small mines will incur $2,675 [1 pieces x ($1,850 + $825)].

MSHA estimates that both large and small mines will choose to retrofit their equipment by making modifications to existing engines (option two) for 75 percent of their equipment, 496 pieces in large mines (662 x 0.75) and 10 pieces in small mines (14 x 0.75). The cost of modifying an existing engine to meet a part 7, subpart E, approval could range from $0 to as much as 50 percent of the cost of a new engine. On the conservative side, MSHA estimates $4,125 ($8,250 x 0.50) for the equipment cost of modifying an existing engine. It is estimated to take 1 person working 40 hours to make modifications to an existing engine.

The initial compliance costs for retrofitting existing machines by making modifications to existing engines will be about $2,613,500, of which large mines will incur $2,561,850 [496 pieces x ($4,125 + (40 hrs. x $26 wage))] and small mines will incur $51,650 [10 pieces x ($4,125 + (40 hrs. x $26 wage))]. The initial costs were annualized over 10 years to be about $371,150, of which large mines will incur $363,800 [$2,561,850 x 0.142] and small mines will incur $7,350 [$51,650 x 0.142].

Also, under this provision, nonpermissible light duty diesel-powered equipment is required to be provided with an engine approved in accordance with part 7, subpart E. Under this provision costs will be determined to fit all 1,674 nonpermissible light duty pieces. All of this type of equipment

is estimated to have a 3 year life. The effective date for this provision has been delayed for 3 years. Thus, mine operators will probably not retrofit existing nonpermissible light duty equipment that has an estimated life of 3 years. When the mine operator replaces this equipment after the 3 year delayed effective date, the cost incurred by the mine operator for this provision will be the cost passed on by the machine manufacturer for providing the machine with a subpart E approved engine. This cost will be distributed over all machines with subpart E engine features sold by the manufacturer. MSHA estimates that the per unit cost increase related to the subpart E engine features for each machine sold will be about $1,500. As noted earlier, this provision will affect 1,674 nonpermissible light duty pieces, of which 1,663 pieces are in large mines and 11 pieces are in small mines. The initial compliance cost will be about $2,511,000, of which large mines will incur $2,494,500 [1,663 pieces x $1,500] and small mines will incur $16,500 [11 pieces x $1,500]. The initial costs were annualized over a 3 year period to be $956,700, of which large mines will incur $950,400 [$2,494,500 x 0.381] and small mines will incur $6,300 [$16,500 x 0.381].

Paragraph (c) also requires that nonpermissible diesel-powered equipment meet the requirements of §§ 75.1909 and 75.1910. These costs are determined in §§ 75.1909 and 75.1910 of this part IV analysis.

Section 75.1908 - Nonpermissible Diesel-powered Equipment - Categories

There are no compliance costs associated with the section. The section sets forth definitions of diesel-powered equipment categorized as: heavy duty equipment; light duty equipment; attended equipment; and special class equipment.

Section 75.1909 - Nonpermissible Diesel-powered equipment, Design and Performance Requirements

The total initial compliance costs in this section will be about $11.5 million, of which large mines will incur $11.3 million and small mines will incur $243,075. The total annualized compliance costs will be about $2.5 million, of which large and small mines will incur $2.48 million and $45,350, respectively. The total annual compliance costs for this section will be about $495,175, of which large and small mines will incur $483,600 and $11,575, respectively.

Section 75.1909(a)(1) requires that nonpermissible diesel-powered equipment have an engine approved under part 7, subpart E. With respect to this provision, the compliance costs for nonpermissible heavy duty equipment was determined in § 75.1907(c) and the compliance costs for nonpermissible light duty equipment was determined in § 75.1907(d).

Paragraph (a)(1) also requires that nonpermissible diesel-powered equipment have air cleaners that are sized in accordance with manufacturers recommendations and air filter service indicators set in accordance with the engine manufacturers

recommendations. There are no compliance costs for these provisions because air cleaners and air filter indicators on existing machines normally will meet these requirements.

Section 75.1909(a)(2) requires at least one portable multipurpose dry chemical type (ABC) fire extinguisher on each piece of nonpermissible equipment. There are 2,350 nonpermissible pieces of this equipment, of which 1,674 pieces are nonpermissible light duty machines, 517 pieces are nonpermissible heavy duty machines, and 159 are nonpermissible nonself-propelled pieces. Although these existing machines carry fire extinguishers, MSHA estimates that about 75 percent do not carry the 20 pound type of fire extinguisher required by this rule. Thus, of the 2,350 pieces, about 1,763 pieces (75 percent) will need to purchase a fire extinguisher required by this provision. Of the 1,763 pieces, about 1,744 pieces are in large mines and 19 pieces in small mines. A fire extinguisher meeting the requirements of this provision will cost about $90, require no annual maintenance, and last about 5 years. The initial compliance costs will be about $158,675, of which large mines will incur $156,975 [1,744 pieces x $90] and small mines will incur $1,700 [19 pieces x $90]. The initial costs were annualized over a 5 year period to be about $38,725, of which large mines will incur $38,300 [$156,975 x 0.244] and small mines will incur $425 [$1,700 x 0.244]. There are no annual costs for this provision.

Section 75.1909(a)(3)(i) requires that the fuel tank and

fuel lines shall not leak. When maintenance is performed the fuel tank and lines are checked to see if they leak. This provision is a work practice and does not cause an increased cost.

Section 75.1909(a)(3)(ii) requires a fuel tank that is substantially constructed and protected against damage by collision. Most fuel tanks on nonpermissible equipment are substantially constructed, but MSHA estimates that 50 percent of nonpermissible light duty pieces will need metal guards to protect the fuel tank against collision. Of the 1,674 nonpermissible light duty pieces 837 pieces (50 percent) are affected. Of the 837 pieces, 832 are in large mines and 5 are in small mines. Material costs will be about $25 and 2 hours will be needed for installation at a rate of $26 per hour. The initial compliance costs will be about $64,475, of which large mines will incur $64,075 [832 pieces x ($25 materials + (2 hrs. x $26 wage))] and small mines will incur $400 [5 pieces x ($25 materials + (2 hrs. x $26 wage))]. The life of nonpermissible light duty machines is estimated to be about 3 years. Thus the initial costs were annualized over a 3 year period to be about $24,575, of which large mines will incur $24,425 [$64,075 x 0.381] and small mines will incur $150 [$400 x 0.381]. There are no annual costs associated with this provision.

Sections 75.1909(a)(3)(iii) and (iv) require a vent opening be provided that maintains atmospheric pressure in the tank.

Paragraph (a)(3)(iv) requires that a self-closing filler cap be used. A vent opening to maintain atmospheric pressure is a feature of a self-closing filler cap. MSHA estimates that about 75 percent (or 1,763 pieces) of the 2,350 nonpermissible pieces will need a self-closing filler cap. Of the 1,763 pieces, 1,744 pieces are in large mines and 19 pieces are in small mines. A self-closing cap will cost about $40 and take 15 minutes (0.25 hours) of installation at a rate of $26 per hour. The initial compliance costs will be about $82,000, of which large mines will incur $81,100 [1,744 pieces x ($40 cap + (0.25 hrs. x $26 wage))] and small mines will incur $900 [19 pieces x ($40 cap + (0.25 hrs. x $26 wage))]. Throughout this section, whenever initial compliance costs are determined based upon using a combination of nonpermissible equipment that is nonself-propelled, self-propelled light duty, and self-propelled heavy duty, MSHA used an estimated machine life of 5 years in which to annualize initial costs. This 5 year figure is based upon a weighted average of the life of the nonpermissible nonself-propelled, light and heavy duty self-propelled machines. The initial costs were annualized over a 5 year period to be about $20,025, of which large mines will incur $19,800 [$81,100 x 0.244] and small mines will incur $225 [$900 x 0.244]. There are no annual compliance costs for this provision.

Section 75.1909(a)(3)(v) requires that the fuel tank, filler and vent be located so that any spillage during refueling, or leaks will not contact hot surfaces. Of the 2,350 nonpermissible

pieces, MSHA estimates that 10 percent (or 235 pieces) will need to relocate the fuel tank or filler to a different area of the machine. Of the 235 pieces, 233 pieces are in large mines and 2 pieces are in small mines. Relocating the components is estimated to take 2 hours and clamping materials are estimated to cost about $25. The initial compliance costs will be about $18,100, of which large mines will incur $17,950 [233 pieces x ($25 materials + (2 hrs. x $26 wage))] and small mines will incur $150 [2 pieces x ($25 materials + (2 hrs. x $26 wage))]. Thus the initial costs were annualized over a 5 year period to be about $4,450, of which large mines will incur $4,400 [$17,950 x 0.244] and small mines will incur $50 [$150 x 0.244]. There are no annual compliance costs for this provision.

Section 75.1909(a)(3)(vi) requires that fuel line piping be either steel wire reinforced, or synthetic elastomer covered hose suitable for use with diesel fuel that has been tested and has been determined to be fire resistant by the manufacturer; or metal. Of the 2,350 nonpermissible pieces, MSHA estimates that 50 percent (or 1,175 pieces) will need to install some type of fire resistant hose on the machine. Of the 1,175 pieces, 1,163 pieces are in large mines and 12 pieces are in small mines. The fire resistant hosing is estimated to cost about $10 and take about 1 hour to install. The initial compliance costs will be about $42,325, of which large mines will incur $41,875 [1,163 pieces x ($10 hosing + (1 hrs. x $26 wage))] and small mines will incur $450 [12 pieces x ($10 hosing + (1 hrs. x

$26 wage))]. The initial costs were annualized over a 5 year period to be about $4,450, of which large mines will incur $10,225 [$41,875 x 0.244] and small mines will incur $125 [$450 x 0.244]. There are no annual compliance costs for this provision.

Section 75.1909(a)(3)(vii) requires fuel line piping to be clamped. This is a standard work practice. MSHA estimated no compliance costs related to this provision.

Sections 75.1909(a)(3)(viii) and (ix) require that primary fuel lines shall be located such that leaks do not contact hot surfaces, and they must be separated from electrical wiring and protected from damage in ordinary use. Of the 2,350 nonpermissible pieces, MSHA estimates that 25 percent (or 587 pieces) will need to reroute fuel lines to meet the requirements of the provision. Of the 587 pieces, 581 pieces are in large mines and 6 pieces are in small mines. Rerouting the lines is estimated to require about $25 in materials and take about 1 hour. The initial compliance costs will be about $29,975, of which large mines will incur $29,650 [581 pieces x ($25 material + (1 hrs. x $26 wage))] and small mines will incur $325 [6 pieces x ($25 material + (1 hrs. x $26 wage))]. The initial costs were annualized over a 5 year period to be about $7,350, of which large mines will incur $7,250 [$29,650 x 0.244] and small mines will incur $100 [$325 x 0.244]. There are no annual compliance costs for this provision.

Section 75.1909(a)(3)(x) requires a manual shutoff valve be installed in the fuel system. Of the 2,350 nonpermissible

pieces, MSHA estimates that 80 percent (or 1,880 pieces) will need to install a manual shutoff valve in the fuel system. Of the 1,880 pieces, 1,860 pieces are in large mines and 20 pieces are in small mines. The cost of the manual shutoff valve is estimated at $5 and will take 30 minutes (0.5 hours) to install. The initial compliance costs will be about $33,875, of which large mines will incur $33,500 [1,860 pieces x ($5 valve + (0.5 hrs. x $26 wage))] and small mines will incur $375 [20 pieces x ($5 valve + (0.5 hrs. x $26 wage))]. The initial costs were annualized over a 5 year period to be about $8,275, of which large mines will incur $8,175 [$33,500 x 0.244] and small mines will incur $100 [$375 x 0.244]. There are no annual compliance costs for this provision.

Section 75.1909(a)(3)(xi) requires a fuel filter and a water separator. Of the 2,350 nonpermissible pieces, MSHA estimates that 25 percent (or 587 pieces) will need to install a fuel filter and water strainer unit. Of the 587 pieces, 581 pieces are in large mines and 6 pieces are in small mines. The fuel filter and water strainer unit is estimated to cost about $60 and will take 20 minutes (0.3333 hours) to install. The initial compliance costs will be about $40,325, of which large mines will incur $39,900 [581 pieces x ($60 unit + (0.3333 hrs. x $26 wage))] and small mines will incur $425 [6 pieces x ($60 unit + (0.3333 hrs. x $26 wage))]. The initial costs were annualized over a 5 year period to be about $9,850, of which large mines will incur $9,750 [$39,900 x 0.244] and small mines will incur

$100 [$425 x 0.244]. There are no annual compliance costs for this provision.

Section 75.1909(a)(4) requires that nonpermissible equipment that has an air cooled engine have a sensor to monitor engine temperature and provide a visual warning of an overheated cylinder head. Of the 2,350 nonpermissible pieces, MSHA estimates that 25 percent (or 587 pieces) will need to install a sensor to monitor the temperature and provide warning of an overheated cylinder head on an air cooled engine. Of the 587 pieces, 581 pieces are in large mines and 6 pieces are in small mines. The sensor is estimated to cost about $250 and will take 30 minutes (0.5 hours) to install. The initial compliance costs will be about $154,375, of which large mines will incur $152,800 [581 pieces x ($250 sensor + (0.5 hrs. x $26 wage))] and small mines will incur $1,575 [6 pieces x ($250 sensor + (0.5 hrs. x $26 wage))]. The initial costs were annualized over a 5 year period to be about $37,700, of which large mines will incur $37,300 [$152,800 x 0.244] and small mines will incur $400 [$1,575 x 0.244]. There are no annual compliance costs for this provision.

Section 75.1909(a)(5) requires guarding to protect fuel, hydraulic, and electric lines when such lines pass near rotating parts and to protect the lines in the event of shaft failure. Of the 2,350 nonpermissible pieces, MSHA estimates that 90 percent (or 2,115 pieces) will need to install guarding to protect fuel, hydraulic, and electric lines. Of the 2,115 pieces, 2,093 pieces

are in large mines and 22 pieces are in small mines. The guarding is estimated to cost about $50 and will take 4 hours to install. The initial compliance costs will be about $325,725, of which large mines will incur $322,325 [2,093 pieces x ($50 guarding + (4 hrs. x $26 wage))] and small mines will incur $3,400 [22 pieces x ($50 guarding + (4 hrs. x $26 wage))]. The initial costs were annualized over a 5 year period to be about $79,475, of which large mines will incur $78,650 [$322,325 x 0.244] and small mines will incur $825 [$3,400 x 0.244]. There are no annual compliance costs for this provision.

Section 75.1909(a)(6) requires that all hydraulic tanks, fillers, vents and lines on affected equipment be located so that any spillage or leaks will not contact hot surfaces. Of the 2,350 nonpermissible pieces, MSHA estimates that 90 percent (or 2,115 pieces) will need to either reroute lines or relocate tank filler vents in order to prevent spills from contacting hot surfaces. Of the 2,115 pieces, 2,093 pieces are in large mines and 22 pieces are in small mines. The cost for materials is estimated at $20 and will take 4 hours of labor. The initial compliance costs will be about $262,300, of which large mines will incur $259,550 [2,093 pieces x ($20 materials + (4 hrs. x $26 wage))] and small mines will incur $2,750 [22 pieces x ($20 materials + (4 hrs. x $26 wage))]. The initial costs were annualized over a 5 year period to be about $64,025, of which large mines will incur $63,350 [$259,550 x 0.244] and small mines will incur $675 [$2,750 x 0.244]. There are no annual compliance

costs for this provision.

Section 75.1909(a)(7) requires reflectors or warning lights mounted on the equipment which can be readily seen in all directions. There are no compliance costs for this provision because the affected equipment already meets the requirements of this section.

Section 75.1909(a)(8) requires a means to direct exhaust gas away from the equipment operator and persons required to be on board the machine. Of the 2,350 nonpermissible pieces, MSHA estimates that 75 percent (or 1,763 pieces) will need to install piping which will redirect exhaust gas away from the equipment operator. Of the 1,763 pieces, 1,744 pieces are in large mines and 19 pieces are in small mines. The cost for materials and piping is estimated at $10 and will take 15 minutes (0.254 hours) of labor. The initial compliance costs will be about $29,100, of which large mines will incur $28,775 [1,744 pieces x ($10 piping + (0.25 hrs. x $26 wage))] and small mines will incur $325 [19 pieces x ($10 piping + (0.25 hrs. x $26 wage))]. The initial costs were annualized over a 5 year period to be about $7,125, of which large mines will incur $7,025 [$28,775 x 0.244] and small mines will incur $100 [$325 x 0.244]. There are no annual compliance costs for this provision.

Section 75.1909(a)(9) requires a means to prevent unintentional free and uncontrolled descent from personnel elevating work platforms. There are no compliance costs because equipment affected by this provision in underground coal mines

meets the requirements of this provision.

Section 75.1909(a)(10) requires a means to prevent the spray from ruptured hydraulic or lubricating oil lines from being ignited by contact with engine exhaust system component surfaces. MSHA estimates that all 2,350 nonpermissible pieces will be affected by this provision. Of the 2,350 pieces, 2,325 pieces are in large mines and 25 pieces are in small mines. To prevent the above situation from occurring the mine operator could either use: a water cooled exhaust manifold, non-absorbing temperature insulating materials; partitions to isolate hydraulic components from the engine; or approved fire resistant hydraulic fluid. In some cases, this provision can be accomplished with a small amount of materials and labor costs, and in other cases more extensive cost modifications to the equipment would be required. This provision will affect self-propelled heavy and light duty equipment, and nonself-propelled equipment.

With respect to self-propelled heavy duty and nonself-propelled equipment, MSHA assumes that manufacturers will provide a kit that the mine operator can use to modify the machine in order to fulfill the requirements of this provision. Under this assumption, individual mines will not incur direct developmental costs. The manufacturer's developmental costs will be spread over the number of kits sold. This provision will affect 676 pieces of which 517 pieces are nonpermissible heavy duty equipment and 159 pieces are nonpermissible nonself-propelled equipment. Of the 676 pieces, 662 pieces are in large mines and

14 pieces are in small mines. On average, the equipment cost incurred by the operator to modify a nonpermissible heavy duty and nonself-propelled machine is estimated to be about $3,000. Labor time to make the required modifications is estimated at 8 hours at a rate of $26 per hour. The initial compliance costs will be about $2,168,625, of which large mines will incur $2,123,700 [662 pieces x ($3,000 + (8 hrs. x $26 wage))] and small mines will incur $44,925 [14 pieces x ($3,000 + (8 hrs. x $26 wage))]. The initial costs were annualized over a 10 year period to be about $307,975, of which large mines will incur $301,575 [$2,123,700 x 0.142] and small mines will incur $6,400 [$44,925 x 0.142].

With respect to nonpermissible light duty equipment, this provision will affect 1,674 pieces, of which 1,663 pieces are in large mines and 11 pieces are in small mines. MSHA estimates that modification costs for nonpermissible light duty equipment will be about 10 percent of the modification costs for nonpermissible heavy duty equipment (or $300). In addition, labor to make the required modifications on light duty equipment will take 4 hours. Further, mine operators will incur some developmental expense when making modifications to light duty equipment. A developmental expense is the cost associated with determining how to redesign the piece of light duty equipment in order to make the modifications required by the provision. Once developmental expenses have been incurred by determining how to make modifications to a specific model, then those modifications

can be used on all equipment of that same model type. Thus, a developmental expense does not apply to every machine, but rather to each different type of model in the mine. Concerning nonpermissible light duty equipment, MSHA estimates that large mines will have 5 different model types and small mines will have 2 different model types. Developmental expenses are estimated at $600 per model type. Thus, the initial costs for making modifications and incurring developmental expenses for light duty equipment will be about $1,168,300, of which large mines will incur $1,145,850 [(1,663 pieces x ($300 + (8 hrs. x $26 wage))) + (158 mines x $600 x 5 models)] and small mines will incur $22,450 [(11 pieces x ($300 + (8 hrs. x $26 wage))) + (15 mines x $600 x 2 models)]. The initial costs were annualized over a 3 year period to be about $445,125, of which large mines will incur $436,575 [$1,145,850 x 0.381] and small mines will incur $8,550 [$22,450 x 0.381].

Section 75.1909(b)(1) requires a means that insures no stored hydraulic energy which will cause machine articulation is available after the engine is shutdown. An orifice device, which relieves stored hydraulic energy after the machine has been shutdown, will have to be purchased and installed on about 25 percent of heavy duty nonpermissible pieces of equipment. Thus, 129 pieces of the 517 nonpermissible heavy duty pieces of equipment are affected by this provision. Of the 129 pieces, about 126 pieces are in large mines and 3 pieces are in small mines. The orifice device costs about $50 and installation will

take 30 minutes (0.5 hours). The initial compliance costs will be about $8,150, of which large mines will incur $7,950 [126 pieces x ($50 orifice + (0.5 hrs. x $26 wage))] and small mines will incur $200 [3 pieces x ($50 orifice + (0.5 hrs. x $26 wage))]. Since only heavy duty equipment is affected by this provision and such equipment has a longer life, the initial costs were annualized over a 10 year period to be about $1,175, of which large mines will incur $1,125 [$7,950 x 0.142] and small mines will incur $50 [$200 x 0.142]. There are no annual compliance costs for this provision.

Sections 75.1909(b)(2) and (b)(3) require a neutral start feature which insures that engine cranking torque will not be transmitted through the powertrain and cause machine movement on vehicles utilizing fluid power transmissions. Paragraph (b)(3) require that controls for machines with steering wheels and brake pedals and accelerator be of automatic orientation. Self-propelled diesel-powered equipment is equipped with the features noted above and thus, there are no compliance costs for these provisions.

Sections 75.1909(b)(4) and (b)(5) require an audible warning device conveniently located near the operator and lights provided and maintained on both ends of the equipment. Nonpermissible self-propelled diesel-powered equipment currently have the warning device and required lights, thus, there is no compliance cost for these sections.

Section 75.1909(b)(6) requires service brakes that act on

each wheel of the vehicle and are designed such that failure of any single component, except the brake actuation pedal or other similar device, will not result in a complete loss of service braking capability. MSHA estimates that this provision will affect both permissible equipment and nonpermissible heavy duty equipment. There are 434 heavy duty permissible and nonpermissible pieces, of which 419 pieces are in large mines and 15 pieces are in small mines. Service brakes and related equipment cost about $6,000 and take 16 hours to install. Annual maintenance is estimated to be 10 percent of the original equipment price or $600. The initial compliance costs to install the brakes on heavy duty equipment will be about $2,784,550, of which large mines will incur $2,688,300 [419 pieces x ($6,000 brakes + (16 hrs. x $26 wage))] and small mines will incur $96,250 [15 pieces x ($6,000 brakes + (16 hrs. x $26 wage))]. Heavy duty equipment last longer than light duty equipment, thus, the initial costs were annualized over a 10 year period to be about $395,425, of which large mines will incur $381,750 [$2,688,300 x 0.142] and small mines will incur $13,675 [$96,250 x 0.142]. The total annual compliance costs for heavy duty equipment will be $260,400, of which large mines will incur $251,400 [419 pieces x ($6,000 x 0.10)] and small mines will incur $9,000 [15 pieces x ($6,000 x 0.10)].

In addition, of 1,674 nonpermissible light duty equipment about 15 percent (or 251 pieces) will need service brakes. Of the 251 pieces, 249 pieces are in large mines and 2 pieces are in

small mines. The initial compliance costs to install the brakes on light duty equipment will be about $1,610,450, of which large mines will incur $1,597,600 [249 pieces x ($6,000 brakes + (16 hrs. x $26 wage))] and small mines will incur $12,850 [2 pieces x ($6,000 brakes + (16 hrs. x $26 wage))]. Light duty equipment does not last as long as heavy duty equipment, and thus, the initial costs were annualized over a 3 year period to be about $613,600, of which large mines will incur $608,700 [$1,597,600 x 0.381] and small mines will incur $4,900 [$12,850 x 0.381]. The total annual compliance costs for light duty equipment will be $150,600, of which large mines will incur $149,400 [249 pieces x ($6,000 x 0.10)] and small mines will incur $1,200 [2 pieces x ($6,000 x 0.10)]

Section 75.1909(b)(7) requires service brakes that safely bring the fully loaded vehicle to a complete stop on the maximum grade on which it is operated. Current brakes on machines are sufficient for the purpose intended by the provision, thus, there are no compliance costs for this section.

Section 75.1909(b)(8) requires that no device which traps a column of fluid to hold the brake in the applied position shall be installed in any brake system, unless the trapped column of fluid is released when the operator is no longer in contact with the brake activation device. MSHA estimates that about 10 percent of the 1,674 pieces of light duty equipment (167 pieces) will require labor work in order to remove the device that traps a column of fluid to hold the brake in

position. Of the 167 pieces, 166 pieces are in large mines and 1 pieces are in small mines. Removing the trap device will take 30 minutes (0.5 hours). The initial compliance costs will be about $2,275, of which large mines will incur $2,175 [166 pieces x (0.5 hrs. x $26 wage)] and small mines will incur less than $100 [1 piece x (0.5 hrs. x $26 wage)]. The initial costs were annualized over a 3 year period to be about $900, of which large mines will incur $850 [$2,175 x 0.381] and small mines will incur less than $50 [$100 x 0.381]. There are no annual compliance costs for this provision.

Sections 75.1909(c)(1) through (c)(6) require that self-propelled heavy duty pieces of equipment be provided with a supplemental braking system. This provision will affect nonpermissible heavy duty machines and permissible heavy duty machines. Modifications are needed to the braking systems of all 517 nonpermissible heavy duty machines (505 pieces in large mines and 12 pieces in small mines). The modifications will involve installation of: an orifice in the brake system; a hand pump and valve; and a declutch valve to insure that the supplemental braking system is released before the equipment can be trammed. The modifications are estimated to cost approximately $3,000 and take 2 persons each working 4 hours (a total of 8 hours) to perform. The initial compliance costs for nonpermissible heavy duty equipment will be about $1,658,550, of which large mines will incur $1,620,050 [505 pieces x ($3,000 + (8 hrs. x $26 wage))] and small mines will incur $38,500 [12 pieces x

($3,000 + (8 hrs. x $26 wage))]. The initial costs were annualized over a 10 year period to be about $235,525, of which large mines will incur $230,050 [$1,620,050 x 0.142] and small mines will incur $5,475 [$38,500 x 0.142]. There are no annual compliance costs.

Only an orifice costing about $50 needs to be installed on the 567 permissible heavy duty machines (542 pieces in large mines and 25 pieces in small mines). Installation of the orifice device is estimated to take 30 minutes (0.5 hours). The initial compliance costs for permissible heavy duty equipment will be about $35,725, of which large mines will incur $34,150 [542 pieces x ($50 orifice + (0.5 hrs. x $26 wage))] and small mines will incur $1,575 [25 pieces x ($50 orifice + (0.5 hrs. x $26 wage))]. The initial costs were annualized over a 10 year period to be about $5,075, of which large mines will incur $4,850 [$34,150 x 0.142] and small mines will incur $225 [$1,575 x 0.142]. There are no annual compliance costs.

Section 75.1909(d) requires that light duty self-propelled diesel-powered equipment, except rail mounted equipment, be provided with a parking brake that holds the fully loaded equipment stationary on the maximum grade on which it is operated despite any contraction of the brake parts, exhaustion of any nonmechanical source of energy or leakage. This device is currently on light duty equipment thus, there are no compliance costs for this provision. This provision also applies to heavy duty permissible equipment, however, there is no compliance cost

because this equipment already complies with the provision.

Section 75.1909(e) requires that the supplemental and park brake systems required by paragraphs (c) and (d) will be applied when the equipment operator is not at the controls of the equipment, except during movement of disabled equipment. This is a work practice that does not involve costs. Thus, there are no compliance costs for this section.

Section 75.1909(f) requires that self-propelled personnel elevating work platforms be provided with a means that insures the parking braking system is released before the equipment can be trammed and be designed to insure the brake is fully released at all times while the equipment is trammed. These pieces of equipment are in compliance and thus, there are no estimated compliance costs.

Section 75.1909(g) requires that equipment which discharges its exhaust directly into a return air course shall be provided with a power package approved in accordance with subpart F. It is difficult to determine if mine operators will choose this option or an alternative method to deal with exhaust gas. Thus, there are no compliance costs determined for this section.

Section 75.1909(h) requires that self-propelled heavy duty equipment meeting the requirements of § 75.1908(a) be provided with an automatic fire suppression system meeting the requirements of § 75.1911. Of the 517 pieces of nonpermissible self-propelled diesel-powered equipment, approximately 20 percent (or 103 pieces) will need an automatic fire suppression system.

Of the 103 pieces, 101 pieces are in large mines and 2 pieces are in small mines. The pieces of equipment that will need an automatic fire suppression system to comply with the standard will be those pieces that currently have either: a manual fire suppression system; or no fire suppression system at all. MSHA assumes that of the equipment that needs an automatic fire suppression system, 50 percent already has a manual fire suppression system and 50 percent has no fire suppression system at all. Thus, of the 101 pieces in large mines, 51 pieces have a manual fire suppression system and 50 pieces have no fire suppression system at all. Of the 2 pieces in small mines, 1 piece has a manual fire suppression system and 1 piece has no fire suppression system. Fire suppression systems installed on machines can have either one or two tanks that hold the fire suppressant material. Heavy duty equipment needs a two tank system. The purchase and installation cost of an automatic fire suppression system for heavy duty equipment is estimated to be about $4,875 for a two tank system. The purchase and installation cost to convert a manual to an automatic fire suppression system with two tanks for heavy duty equipment is estimated to cost $1,875.

The initial compliance costs to place an automatic fire suppression system on nonpermissible heavy duty equipment will be about $346,125, of which large mines will incur $339,375 [(51 pieces x $1,875) + (50 pieces x $4,875)] and small mines will incur $6,750 [(1 piece x $1,875) + (1 piece x $4,875)]. The

initial costs were annualized over a 10 year period to be about $49,175, of which large mines will incur $48,200 [$339,375 x 0.142] and small mines will incur $975 [$6,750 x 0.142]. The annual compliance costs are estimated to be 10 percent of the original purchase and installation price. The total annual compliance costs will be $34,625, of which large mines will incur $33,950 [(51 pieces x $1,875 x 0.10) + (50 pieces x $4,875 x 0.10)] and small mines will incur $675 [(1 piece x $1,875 x 0.10) + (1 piece x $4,875 x 0.10)].

Section 75.1909(i) requires self-propelled nonpermissible light duty equipment meeting the requirements of § 75.1908(b) be provided with an automatic or manual fire suppression system meeting the requirements of § 75.1911. Of the 1,674 pieces of nonpermissible self-propelled diesel-powered equipment, approximately 10 percent (or 167 pieces) will need an automatic or manual fire suppression system. Of the 167 pieces, 166 pieces are in large mines and 1 piece is in a small mine. The pieces of equipment that will need an automatic fire suppression system to comply with the standard will be those pieces that currently have no fire suppression system at all. MSHA assumes that of the equipment that needs a fire suppression system, 50 percent will get a manual fire suppression system and 50 percent will get an automatic fire suppression system. Thus, of the 166 pieces in large mines, 83 pieces will get a manual fire suppression system and 83 pieces will get an automatic fire suppression system. The 1 piece in a small mine is assumed to get an automatic fire

suppression system. Light duty equipment needs only a one tank system. The purchase and installation cost of an automatic fire suppression system for light duty equipment is estimated to be about $3,300 for a one tank system. The purchase and installation cost to convert a manual to an automatic fire suppression system with one tank for light duty equipment is estimated to cost $1,500.

The initial compliance costs to place an automatic or manual fire suppression system on nonpermissible light duty equipment will be about $401,700, of which large mines will incur $398,400 [(83 pieces x $1,500) + (83 pieces x $3,300)] and one small mine will incur $3,300 [(1 piece x $3,300)]. The initial costs were annualized over a 3 year period to be about $153,075, of which large mines will incur $151,800 [$398,400 x 0.381] and one small mine will incur $1,275 [$3,300 x 0.381]. The annual compliance costs are estimated to be 10 percent of the original purchase and installation price. The total annual compliance costs will be $40,200, of which large mines will incur $39,850 [(83 pieces x $1,500 x 0.10) + (83 pieces x $3,300 x 0.10)] and one small mine will incur $350 [(1 piece x $3,300 x 0.10].

Section 75.1909(j)(1) requires that nonpermissible equipment that is not self-propelled equipment be provided with a means to prevent inadvertent movement of the equipment when parked. Mine operators can use wheel blocks, which are available at the mine, to satisfy the requirement of this provision. Thus, there are no compliance costs associated with this provision.

Section 75.1909(j)(2) requires that nonpermissible equipment that is not self-propelled equipment have features such as safety chains or other suitable secondary connections on equipment that is being towed. MSHA estimates that this will affect about 79 pieces of equipment, of which 78 pieces are in large mines and 1 piece is in a small mine. The cost for safety chains is estimated at about $20 and 30 minutes (0.5 hours) are needed to install the chains. No annual maintenance is required and the chains are estimated to last about 5 years.

The initial compliance costs will be about $2,725, of which large mines will incur $2,625 [78 pieces x ($20 + (0.5 hrs. x $26 wage))] and small mines will incur less than $100 [1 piece x ($20 + (0.5 hrs. x $26 wage))]. The initial costs were annualized over a 5 year period to be about $675, of which large mines will incur $650 [$2,625 x 0.244] and small mines will incur $25 [$100 x 0.244].

Section 75.1909(j)(3) requires that nonpermissible equipment that is not self-propelled equipment have an automatic fire suppression system meeting the requirements of § 75.1911. Of the 159 pieces of nonself-propelled diesel-powered equipment, approximately 30 percent (or 48 pieces) will need an automatic fire suppression system. Of the 48 pieces, 47 pieces are in large mines and 1 piece is in a small mine. The pieces of equipment that will need an automatic fire suppression system to comply with the standard will be those pieces that currently have either: a manual fire suppression system; or no fire suppression

system. MSHA assumes that of the equipment that needs an automatic fire suppression system, 80 percent already has a manual fire suppression system and 20 percent has no fire suppression system at all. Thus, of the 47 pieces in large mines, 38 pieces have a manual fire suppression system and 10 pieces have no fire suppression system. The 1 piece in a small mine is assumed to have no fire suppression system at all. Fire suppression systems installed on machines can have either one or two tanks that hold the fire suppressant material. Nonself-propelled equipment needs only a one tank system. The purchase and installation cost of an automatic fire suppression system for nonself-propelled equipment is estimated to be about $3,300 for a one tank system. The purchase and installation cost to convert a manual to an automatic fire suppression system with one tank for nonself-propelled equipment is estimated to cost $1,500.

The initial compliance costs to place an automatic fire suppression system on nonself-propelled equipment will be about $93,300, of which large mines will incur $90,000 [(38 pieces x $1,500) + (10 pieces x $3,300)] and the one small mine will incur $3,300 [(1 piece x $3,300)]. The initial costs were annualized over a 10 year period to be about $13,275, of which large mines will incur $12,800 [$90,000 x 0.142] and small mines will incur $475 [$3,300 x 0.142]. The annual compliance costs are estimated to be 10 percent of the original purchase and installation price. The total annual compliance costs will be $9,350, of which large

mines will incur $9,000 [(38 pieces x $1,500 x 0.10) + (10 pieces x $3,300 x 0.10)] and the one small mine will incur $350 [(1 piece x $3,300 x 0.10)].

Section 75.1910 Nonpermissible Diesel-powered Equipment; Electrical System Design and Performance Requirements

This section requires nonpermissible diesel-powered equipment to comply with certain electrical system design and performance requirements. The total initial compliance costs in this section will be about $480,675, of which large mines will incur $475,500 and small mines will incur about $5,175. The total annualized compliance costs will be about $117,450, of which large and small mines will incur $116,125 and $1,325, respectively. There are no annual compliance costs for this section.

Section 75.1910(a) requires that overload and short circuit protection be provided for electric circuits and components in accordance with §§ 75.518 and 75.518-1, for equipment specified in this section. There are 2,350 pieces of nonpermissible diesel-powered equipment, of which 2,325 pieces are in large mines and 25 pieces are in small mines. This provision will affect 10 percent of such equipment. Thus, 233 (2,325 x 0.10) pieces are in large mines and 3 (25 x 0.10) pieces are in small mines. Parts will costs $10 and take 30 minutes (0.5 hours) to install by a person earning $26 per hour. The parts are estimated to last the life of the equipment and there are no annual maintenance costs.

The initial compliance costs to install overload and short circuit protection for circuits and components will be about $5,475, of which large mines will incur $5,375 [233 pieces x (10 parts + ($26 wage x 0.5 hrs.))] and small mines will incur $100 [3 pieces x ($10 parts + ($26 wage x 0.5 hrs.))]. Generally, initial compliance costs associated with the machine are annualized over the life of the equipment. Nonpermissible, self-propelled heavy duty and nonself-propelled, diesel-powered equipment is estimated to last about 10 years, while nonpermissible light duty diesel-powered equipment is estimated to have a life of 3 years. Throughout this section, whenever initial compliance costs are determined based upon using a combination of nonpermissible equipment that is nonself-propelled, self-propelled light duty, and self-propelled heavy duty, MSHA used an estimated machine life of 5 years in which to annualized initial costs. This 5 year figure is based upon a weighted average of the life of nonpermissible nonself-propelled machines and, nonpermissible self-propelled heavy and light duty machines. Thus, the initial compliance costs were annualized over a 5 year period to be about $1,350, of which large mines will incur $1,325 [$5,375 x 0.244] and small mines will incur $25 [$100 x 0.244].

Section 75.1910(b) requires that each electric conductor from the battery to the starting motor be protected against short circuit by fuses or other circuit interrupting devices placed as near as practicable to the battery terminals. MSHA estimates

that this will affect all 2,325 pieces in large mines and 25 pieces in small mines. It is estimated to cost about $20 for fuses to install on battery cables in order to prevent a short circuit and take 20 minutes (0.3333 hours) for installation by a person earning $26 per hour. The parts are estimated to last the life of the equipment and there are no annual maintenance costs.

The initial compliance costs to install the fuses will be about $67,375, of which large mines will incur $66,650 [2,325 pieces x (20 fuses + ($26 wage x 0.3333 hrs.))] and small mines will incur $725 [25 pieces x ($20 fuses + ($26 wage x 0.3333 hrs.))]. The initial compliance costs were annualized over a 5 year period to be about $16,450, of which large mines will incur $16,275 [$66,650 x 0.244] and small mines will incur $175 [$725 x 0.244].

Section 75.1910(c) requires that each branch circuit conductor connected to the main circuit between the battery and charging generator be protected against short circuit by fuses or other automatic circuit interrupting devices. This provision will affect 10 percent of all diesel-powered equipment specified by this section. Thus, there are 233 (2,325 x 0.10) pieces in large mines and 3 (25 x 0.10) pieces in small mines affected by this provision. Parts will costs $10 and take 15 minutes (0.25 hours) to install by a person earning $26 per hour. The parts are estimated to last the life of the equipment and there are no annual maintenance costs.

The initial compliance costs to provide overload and short

circuit protection for branch circuit conductors will be about $3,900, of which large mines will incur $3,850 [233 pieces x (10 parts +($26 wage x 0.25 hrs.))] and small mines will incur $50 [3 pieces x ($10 parts + ($26 wage x 0.25 hrs.))]. The initial compliance costs were annualized over a 5 year period to be about $975, of which large mines will incur $950 [$3,850 x 0.244] and small mines will incur $25 [$50 x 0.244].

Section 75.1910(d) requires the electrical system be equipped with a circuit interrupting device by means of which all power conductors can be deenergized. MSHA estimates that this will affect all 2,325 pieces in large mines and 25 pieces in small mines. It is estimated to cost about $20 for a switch that will act as a circuit interrupting device by means of which all power conductors can be deenergized, and take 20 minutes (0.3333 hours) for installation by a person earning $26 per hour. The parts are estimated to last the life of the equipment and there are no annual maintenance costs.

The initial compliance costs to install the switch will be about $67,375, of which large mines will incur $66,650 [2,325 pieces x ($20 switch + ($26 wage x 0.3333 hrs.))] and small mines will incur $725 [25 pieces x ($20 switch + ($26 wage x 0.3333 hrs.))]. The initial compliance costs were annualized over a 5 year period to be about $16,450, of which large mines will incur $16,275 [$66,650 x 0.244] and small mines will incur $175 [$725 x 0.244].

Section 75.1910(e) requires each motor and charging

generator be protected by an automatic overcurrent device. MSHA estimates that this will affect all 2,325 pieces in large mines and 25 pieces in small mines. It is estimated to cost about $20 for fuses to be installed on the motor to prevent a short circuit and take 20 minutes (0.3333 hours) for installation by a person earning $26 per hour. The parts are estimated to last the life of the equipment and there are no annual maintenance costs.

The initial compliance costs to install the fuses on the motor will be about $67,375, of which large mines will incur $66,650 [2,325 pieces x ($20 motor fuses + ($26 wage x 0.3333 hrs.))] and small mines will incur $725 [25 pieces x ($20 motor fuses + ($26 wage x 0.3333 hrs.))]. The initial compliance costs were annualized over a 5 year period to be about $16,450, of which large mines will incur $16,275 [$66,650 x 0.244] and small mines will incur $175 [$725 x 0.244].

Section 75.1910(f) requires each ungrounded conductor to have insulation compatible with the impressed voltage. MSHA estimates that 25 percent of the equipment specified in this section will have to have electrical conductors in the vehicles replaced so that a rise in temperature from normal operation will not damage the insulating materials. Thus, 581 (2,325 x 0.25) pieces will be affected in large mines and 6 (25 x 0.25) pieces will be affected in small mines. Materials consisting of wires and conductors will cost about $50 and it will take 4 hours to install the electrical conductors by a person earning $26 per hour. The parts are estimated to last the life of the equipment

and there are no annual maintenance costs.

The initial compliance costs to replace the electrical conductors will be about $90,400, of which large mines will incur $89,475 [581 pieces x ($50 materials + ($26 wage x 4 hrs.))] and small mines will incur $925 [6 pieces x ($50 materials + ($26 wage x 4 hrs.))]. The initial compliance costs were annualized over a 5 year period to be about $22,075, of which large mines will incur $21,850 [$89,475 x 0.244] and small mines will incur $225 [$925 x 0.244].

Section 75.1910(g) requires all wiring to have adequate mechanical protection to prevent possible short circuits of wires or cables. MSHA estimates that 50 percent of the equipment specified in this section will need to install mechanical guards and reroute wiring in order to provide mechanical protection that prevents damage to wiring or cables. Thus, 1,163 (2,325 x 0.5) pieces will be affected in large mines and 13 (25 x 0.5) pieces will be affected in small mines. Materials will cost about $20 and take 2 hours to install mechanical guards and reroute wiring by a person earning $26 per hour. The parts are estimated to last the life of the equipment and there are no annual maintenance costs.

The initial compliance costs to install mechanical guards and reroute wiring will be about $84,700, of which large mines will incur $83,750 [1,163 pieces x ($20 materials + ($26 wage x 2 hrs.))] and small mines will incur $950 [13 pieces x ($20 materials + ($26 wage x 2 hrs.))]. The initial compliance

costs were annualized over a 5 year period to be about $20,700, of which large mines will incur $20,450 [$83,750 x 0.244] and small mines will incur $250 [$950 x 0.244].

Section 75.1910(h) requires sharp edges and corners be removed at all points where there is a possibility of damaging wires, cables, or conduits by cutting or abrasion. MSHA estimates that this will affect all 2,325 pieces in large mines and 25 pieces in small mines. It is estimated to take 1 hour of labor, by a person earning $26 per hour, for filing or otherwise removing sharp edges and corners where there is a possibility of damaging wires, cables or conduits by cutting or abrasion. There are no annual maintenance costs.

The initial compliance costs to file or otherwise remove sharp edges and corners will be about $61,100, of which large mines will incur $60,450 [2,325 pieces x ($26 wage x 1 hr.)] and small mines will incur $650 [25 pieces x ($26 wage x 1 hr.)]. The initial compliance costs were annualized over a 5 year period to be about $14,925, of which large mines will incur $14,750 [$60,450 x 0.244] and small mines will incur $175 [$650 x 0.244].

Section 75.1910(i) requires that when insulated wires other than cables pass through metal frames, the holes shall be substantially bushed with insulated bushings. In addition, cables shall enter metal frames of motors, splice boxes, and electric components only through proper fittings. MSHA estimates that 25 percent of the equipment specified in this section will have to have grommets or fittings to be installed where wire

passes through metal frames. Thus, 581 (2,325 x 0.25) pieces will be affected in large mines and 6 (25 x 0.25) pieces will be affected in small mines. Materials purchase cost are estimated to be $5 for grommets or fittings and it takes about 1 hour to install where wire passes through metal frames. The parts are estimated to last the life of the equipment and there are no annual maintenance costs.

The initial compliance costs to install the grommets or fittings will be about $18,225, of which large mines will incur $18,025 [581 pieces x ($5 fittings + ($26 wage x 1 hr.))] and small mines will incur $200 [6 pieces x ($5 fittings + ($26 wage x 1 hr.))]. The initial compliance costs were annualized over a 5 year period to be about $4,450, of which large mines will incur $4,400 [$18,025 x 0.244] and small mines will incur $50 [$200 x 0.244].

Sections 75.1910(j) through (o) are provisions concerned with battery box design requirements. Approximately 5 percent of the diesel-powered equipment specified in this section will be affected by the battery box design requirements. Thus, 116 (2,325 x 0.05) pieces in large mines and 1 (25 x 0.05) piece in a small mine will need a battery box in order to protect the exposed battery from damage. A battery box that fulfills the requirements of paragraphs (a)(10) through (a)(15) is estimated to cost about $100. About 1 hour of labor time is needed to install the battery box by a person earning $25 per hour. No annual maintenance is required and the battery box is expected to

last the life of the equipment.

The initial compliance costs to purchase and install battery boxes will be about $14,750, of which large mines will incur $14,625 [116 pieces x ($100 box + (1 hr. x $26 wage))] and small mines will incur $125 [1 piece x ($100 box + (1 hr. x $26 wage))]. The initial costs were annualized over a 5 year period to be about $3,625, of which large mines will incur $3,575 [$14,625 x 0.244] and small mines will incur $50 [$125 x 0.244].

Section 75.1911 - Fire Suppression Systems for Mobile Diesel-Powered Equipment and Fuel Transportation Units

The total annual compliance costs for this section will be $1,221,275, of which large and small mines will incur $1,203,175 and $18,100, respectively. There are no first year or annualized compliance costs in this section. In addition, as detailed below, some of the compliance costs of this standard are included in other sections of this rule.

Sections 75.1911(a) through (h) require that diesel-powered equipment and fuel transportation units utilize a multipurpose dry chemical type fire suppression system approved by a nationally recognized independent testing laboratory. Paragraphs (a) through (h) set forth the characteristics of the required automatic fire suppression system. The compliance costs to retrofit existing self-propelled nonpermissible heavy duty diesel-powered equipment meeting the requirements of § 75.1908(a) with an automatic fire suppression system are included in § 75.1909(h). The compliance costs to retrofit existing self-

propelled nonpermissible light duty diesel-powered equipment meeting the requirements of § 75.1908(b) with a manual or automatic fire suppression system are included in § 75.1909(i). The compliance costs to retrofit existing nonself-propelled nonpermissible diesel-powered equipment with an automatic fire suppression system are included in § 75.1909(j)(3). The compliance costs to retrofit existing permissible diesel-powered equipment with a manual or automatic fire suppression system are set forth in § 75.1907(b)(2).

Section 75.1911(i) requires that all fire suppression systems must be visually inspected at least once each week. With the exception of 11 diesel-powered ambulances and fire fighting machines, all diesel-powered machines will have either a manual or automatic fire suppression system. Of the 2,878 diesel machines in large mines 2,867 pieces (2,878 - 11) will need weekly fire suppression examinations. All 50 pieces in small mines will need the weekly exams. Additionally, MSHA estimates that about 20 percent of 489 diesel fuel transportation units, or 98 units, will have fire suppression systems because they have electrical components and thus must have weekly exams. Of the 98 pieces, 95 are in large mines and 3 are in small mines. Thus, 2,962 pieces (2,867 + 95) in large mines and 53 pieces (50 + 3) in small mines will need weekly exams of the fire suppression system.

It is estimated to take 15 minutes (0.25 hours) to inspect a machine's fire suppression system at a labor rate of $26 per

hour. Large mines operate approximately 50 weeks per year and small mines operate about 40 weeks per year. The annual compliance costs for weekly visual inspections will be about $976,425, of which large mines will incur $962,650 [2,962 pieces x 50 weeks x (0.25 x $26 wage)] and small mines will incur $13,775 [53 pieces x 40 weeks x (0.25 x $26 wage)].

Currently, on average, mines inspect the fire suppression system on machines about once a month. The annual cost associated with current inspections of fire suppression systems is about $227,525. Of the $227,525, large mines will incur $223,625 [2,867 pcs. x 12 mos. x (0.25 x $26 wage)] and small mines will incur $3,900 [50 pcs. x 12 mos. x (0.25 x $26 wage)].

Under the rule, annual compliance costs associated with increasing fire suppression systems inspections from monthly to weekly, will be approximately $748,900 [$976,425 - $227,525], of which large mines will incur $739,025 [$962,650 - $223,625] and small mines will incur $9,875 [$13,775 - $3,900].

In addition § 75.1911(i) also requires that each fire suppression system on diesel-powered machines be tested in accordance with the manufacturer's recommended inspection and maintenance program. MSHA assumes that mine operators will not perform these tests themselves, but rather will contract out the testing to the installers of the fire suppression system. MSHA estimates that such fire suppression system inspections and tests will take about 1 hour and cost the mine operators about $80. These inspections will occur twice a year, and will have to be

conducted on the 2,962 pieces in large mines and 53 pieces in small mines. The annual compliance costs associated with manufacturer recommended inspections and tests will be about $482,400, of which large mines will incur $473,925 [2,962, pieces x $80 x 2 inspections] and small mines will incur $8,475 [53 pieces x $80 x 2 inspections].

Currently, some mines perform the manufacturer recommended inspections and tests on existing diesel-powered equipment. As a conservative figure MSHA estimates that the fire suppression system manufacturer recommended inspections and tests are currently performed on about 10 percent of the diesel-powered equipment, 286 (2,867 x 0.10) existing pieces in large mines and 5 (50 x 0.10) existing pieces in small mines. Thus, the current annual costs for manufacturer recommended inspecting and testing of the fire suppression system on diesel-powered machines will be about $46,575, of which large mines will incur $45,775 [286 pieces x $80 x 2 inspections] and small mines will incur $800 [5 pieces x $80 x 2 inspections].

Under the rule, annual compliance costs associated with manufacturer recommended inspecting and testing of fire suppression systems on diesel-powered machines will be about $435,825 [$482,400 - $46,575], of which large mines will incur $428,150 [$473,925 - $45,775] and small mines will incur $7,675 [$8,475 - $800].

Section 75.1911(j) requires a record to be made for each fire suppression system inspection where a defect is found.

Records are to be held at a surface location of the mine. The record shall include the machine examined, defect found and corrective action taken. With respect to recordkeeping concerning the inspections done in paragraph (i) MSHA estimates that 10 percent of the inspections will show a defect exists.

With respect to paragraph (i), weekly inspections are done on 2,962 diesel machines in large mines and 53 pieces in small mines. Thus, on an annual basis records from weekly inspections performed under paragraph (i) will be made for 14,810 inspections in large mines (2,962 pieces x 1 inspection per week x 50 work weeks per year x 0.10 inspection finding defects) and; 212 inspections in small mines (53 pieces x 1 inspection per week x 40 work weeks per year x 0.10 inspection finding defects). Each record, including maintaining, is estimated to take 5 minutes (0.0833 hours) by a person earning $26 per hour. Thus, the annual costs for records from weekly inspections required by paragraph (i) will be about $32,525, of which large mines will incur $32,075 [14,810 records x 0.0833 hrs. x $26 wage] and small mines will incur $450 [212 records x 0.0833 hrs. x $26 wage].

Also, with respect to paragraph (i), twice a year manufacturer recommended inspections and tests are performed on each machine. Therefore, on an annual basis records from inspections and tests performed under paragraph (i) will be for, 592 inspections in large mines (2,962 pieces x 2 inspections per year x 0.10 inspections finding defects) and; 11 inspections in small mines (53 pieces x 2 inspections per year x 0.10

inspections finding defects). Each record, including maintaining, is estimated to take 5 minutes (0.0833 hours) based upon an inspection and test rate of $80 per hour. Thus, the annual costs for records from manufacturer recommended inspections and tests performed under paragraph (i) will be about $4,025, of which large mines will incur $3,925 [592 inspections x 0.0833 hrs. x $80 wage] and small mines will incur less than $100 [11 inspections x 0.0833 hrs. x $80 wage].

In summary, the annual compliance cost will be the sum of the costs of records that pertain to the weekly inspections and manufacturer recommended inspections and tests required by paragraph (i). Thus, the annual compliance costs will be about $36,550 [$32,525 + $4,025], of which large mines will incur $36,000 [$32,075 + $3,925] and small mines will incur $550 [$450 + $100].

Section 75.1911(k) requires mine operators to instruct affected miners about hazards involved in the operation of fire suppression systems and about safeguards available at each such installation. There will be no compliance costs for this requirement because such training is currently provided under the hazard training requirements of part 48 and of § 75.1101-23, which require that miners be acquainted with the operation of fire suppression equipment available in the mine.

Section 75.1911(l) states that for purposes of § 75.380(f), a fire suppression system installed on diesel-powered equipment and meeting the requirements of § 75.1911 is equivalent to a fire

suppression system meeting the requirements of §§ 75.1107-3 through 75.1107-16. This requirement is a clarification and thus there are no compliance costs for this provision.

Section 75.1912 Fire Suppression Systems for Permanent Underground Diesel Fuel Storage Facilities and Stationary Unattended Diesel-powered Equipment Facilities.

This section shows compliance costs related to fire suppression systems that are on underground permanent diesel fuel storage facilities. The annual compliance costs for this section will be $19,950, of which large and small mines will incur $16,475 and $3,475, respectively. There are no first year or annualized compliance costs in this section.

Sections 75.1912(a) through (g) explain the characteristics of the automatic fire suppression system that is required on underground permanent diesel fuel storage facilities. The compliance costs to purchase and install an automatic fire suppression system on underground permanent diesel fuel storage facilities were determined in § 75.1903(a)(5).

Section 75.1912(h) requires that all fire suppression systems on underground permanent diesel fuel storage facilities (20 in large mines and 5 in small mines) must be visually inspected at least once a week. MSHA estimates that it will take 30 minutes (0.5 hours) per inspection by a person earning $26 per hour. In addition, MSHA established that large mines using diesel-powered equipment operate two shifts per day for approximately 250 days per year (50 weeks at 5 days per week) and

small mines using such equipment operate one shift per day for approximately 160 days per year (40 weeks at 4 days per week).

Thus, annual compliance costs for weekly visual inspections of fire suppression systems on underground permanent diesel fuel storage facilities will be about $15,600, of which large mines will incur $13,000 [20 facilities x 50 weeks x (0.5 hrs. x $26 wage)] and small mines will incur $2,600 [5 facilities x 40 weeks x (0.5 hrs. x $26 wage)].

In addition, § 75.1911(h) also requires that each fire suppression system on underground permanent diesel fuel storage facilities (20 in large mines and 5 in small mines) be inspected and tested in accordance with the manufacturer's recommended inspection and maintenance program. MSHA assumes that mine operators will not perform these tests themselves, but rather will contract out the testing to the installers of the fire suppression system. MSHA estimates that the fire suppression system inspections and tests will take about 1 hour and cost the mine operators about $80. MSHA estimates that these inspections will occur twice a year. The annual compliance costs associated with tests noted above will be about $4,000, of which large mines will incur $3,200 [20 facilities x 2 inspections per yr. x $80] and small mines will incur $800 [5 facilities x 2 inspections per yr. x $80].

Section 75.1912(i) requires a record to be made for each fire suppression system inspection where a defect is found. Records are to be at a surface location of the mine. The record

must record the storage facility examined, defect found and corrective action taken. With respect to recordkeeping concerning the inspections done in paragraph (h) MSHA estimates that 10 percent of the inspections will show a defect exists.

With respect to paragraph (h), weekly inspections are done on 20 underground permanent diesel fuel storage facilities in large mine and 5 such facilities in small mines. Thus, on an annual basis records from inspections performed under paragraph (h) will be made for 100 inspections in large mines (20 facilities x 1 inspection per week x 50 work weeks per year x 0.10 inspection finding defects) and 20 inspections in small mines (5 facilities x 1 inspection per week x 40 work weeks per year x 0.10 inspection finding defects). Each record, including maintaining, is estimated to take 5 minutes (0.0833 hours) by a person earning $26 per hour. Thus, the annual costs for records from inspections required by paragraph (h) will be about $275, of which large mines will incur $225 [100 records x 0.0833 hrs. x $26 wage] and small mines will incur $50 [20 records x 0.0833 hrs. x $26 wage].

Also, with respect to paragraph (h), twice a year inspections and tests are performed on each underground permanent diesel fuel storage facility. Therefore, on an annual basis records from inspections and tests performed under paragraph (h) will be for, 4 inspections in large mines (20 facilities x 2 inspections per year x 0.10 inspections finding defects) and; 1 inspection in a small mine (5 facilities x 2 inspections per year

x 0.10 inspections finding defects). Each record, including maintaining, is estimated to take 5 minutes (0.0833 hours) based upon an inspection and test rate of $80 per hour. Thus, the annual costs for records from manufacturer recommended inspections and tests performed under paragraph (h) will be less than $100, of which large mines will incur less than $50 [4 inspections x 0.0833 hrs. x $80 wage] and small mines will incur less than $25 [1 inspection x 0.0833 hrs. x $80].

In summary, the annual compliance cost will be the sum of the costs of records that pertain to the inspections required by paragraphs (h). Thus, the annual compliance costs will be about $350 [$275 + $75], of which large mines will incur $275 [$225 + $50] and small mines will incur $75 [$50 + $25].

Section 75.1912(j) requires that all miners normally assigned to the active workings of the mine be instructed about any hazards inherent to the operation of all fire suppression systems installed and, where appropriate, the safeguards available for each system. There will be no compliance costs for this requirement because such training is currently provided under the hazard training requirements of part 48 and of § 75.1101-23, which require that miners be acquainted with the operation of fire suppression equipment available in the mine.

Section 75.1913 - Starting Aids

This section addresses the storage and use of volatile fuel starting aids for diesel equipment. The total initial costs are

$66,700, of which large and small mines will incur $66,000 and $700, respectively. The total annualized costs are $9,475, of which large and small mines will incur $9,375 and $100, respectively.

Section 75.1913(a) requires that volatile fuel starting aids shall be used in accordance with recommendations provided by the starting aid manufacturer, the engine manufacturer, and the machine manufacturer. Starting aid manufacturers are already required by Occupational Safety and Health Administration regulations to develop Material Safety Data Sheets (MSDS) for their products. To comply with this provision the mine operator can obtain an MSDS and any other product safety and use information prepared by the starting aid manufacturer, engine manufacturer, and the machine manufacturer, on the safe use of the starting aid. Thus, there will not be any compliance costs to mine operators concerning this provision.

Section 75.1913(b) requires that volatile fuel starting aids be conspicuously marked to indicate the contents. There are no compliance costs to conspicuously mark volatile starting aid cans because labels which are originally provided with such cans meet the requirement. In addition, this provision, requires that containers of volatile fuel starting aids be stored in metal enclosures conspicuously marked, secured, and protected from damage. Under this provision, starting aids carried on diesel-powered nonpermissible machines would have to be encased in a metal enclosure. This standard does not apply to permissible

equipment since starting aids are not permitted on or in areas where such equipment is required. With respect to nonpermissible equipment, MSHA assumes that half in large mines, 1,168 pieces (2,336 x 0.50) and half in small mines, 12 pieces (25 x 0.50) will need to install a metal box required to contain the starting fuel. The cost of the metal box is approximately $50 and 15 minutes of labor (0.25 hours) would be needed to attach the box to the machine.

The first year compliance costs to install the metal boxes on the machines will be about $66,700, of which large mines will incur about $66,000 [1,168 nonperm. pcs. x ($50 box + (0.25 hrs. x $26 wage))], and small mines will incur about $700 [12 nonperm. x ($50 box + (0.25 hrs. x $26 wage))]. The $66,700 was annualized over a 10 year period to be $9,475, of which large mines will incur about $9,375 [$66,000 x 0.142] and small mines will incur about $100 [$700 x 0.142).

Sections 75.1913 (c) and (d) concerning paragraph (c) it requires that volatile fuel starting aids shall not be: (1) taken into or used in areas where permissible equipment is required; (2) used in the presence of open flames or burning flame safety lamps, or when welding or cutting is taking place; or (3) used in any area where 1.0 percent or greater concentration of methane is present. Paragraph (d) requires that compressed oxygen or compressed flammable gases shall not be connected to diesel air start systems. MSHA has not assessed any compliance costs for these requirements because they are work practices that can be

implemented with no additional labor or materials.

Section 75.1914 - Maintenance of Diesel-powered Equipment

This section establishes requirements for the maintenance of diesel-powered equipment that will result in initial costs of $310,550, of which large and small mines will incur about $286,175 and $24,375, respectively. The total annualized costs will be $40,150, of which large and small mines will incur about $36,825 and $3,325, respectively. The total annual costs will be $2.73 million, of which large and small mines will incur about $2.66 million and $66,025, respectively.

Section 75.1914(a) requires that diesel-powered equipment be maintained in approved and safe condition or removed from service. There are no compliance costs associated with this provision.

Sections 75.1914(b) requires that only a person qualified in accordance with § 75.1915 can repair or maintain approved features and those features required by §§ 75.1909 and 75.1910. MSHA has included the compliance cost for using a qualified person in its cost estimates for § 75.1915.

Section 75.1914(c) requires a water scrubber system to be drained and flushed at least once per shift when the equipment is operated. This task is to be performed by a trained person and is done in order to remove material accumulation. There are no compliance costs for training because initial training for operating the machine should encompass the maintenance of the

water scrubber system. However, there are compliance costs with respect to the time spent on draining and flushing the water scrubber. With the exception of part 36 equipment, water scrubber systems are not usually on diesel-powered equipment. MSHA assumes that no nonpermissible equipment have a water scrubber system, and thus there are no costs for this provision.

This provision will affect water scrubber systems on all 567 existing permissible equipment in large and small mines. Of the 567 pieces, 542 are in large mines and 25 are in small mines. In the diesel hearings, a miner testified that it generally takes 10 to 15 minutes to flush a water scrubber [8, p. 308]. MSHA established that large mines using diesel-powered equipment operate two shifts per day for approximately 250 days per year (50 weeks at 5 days per week) and small mines using diesel-powered equipment operate one shift per day for approximately 160 days per year (40 weeks at 4 days per week).

Thus, using 15 minutes of labor (valued at $6.50 based upon a wage rate of $26 per hour) and assuming that mine operators are in compliance with this provision approximately 80 percent of the time, the annual costs to drain and flush a water scrubber will be $357,500, of which large mines will incur about $352,300 [542 perm. pieces x $6.50 x 2 shifts x 250 days x 0.20] and small mines will incur about $5,200 [(25 perm. pieces x $6.50 x 1 shift x 160 days x 0.20].

Sections 75.1914(d) and (e) require that intake air filters be replaced or serviced when dirty or when the intake air

pressure device so indicates. In addition, § 75.1914(e) requires that mobile equipment be inspected by equipment operators before use and that defects affecting safety be reported to the mine operator. As these activities are standard operating procedures, there is no associated compliance cost.

Section 75.1914(f)(1) requires that diesel-powered equipment be examined and tested weekly in accordance with approved checklists and manufacturer maintenance manuals. On average, MSHA estimates that examination and testing takes about 2 hours for a piece of permissible equipment, 30 minutes (0.5 hours) for a nonpermissible heavy duty piece of equipment, and 15 minutes (0.25 hours) for a nonpermissible light duty piece of equipment. Labor is valued at $26 per hour. There are 2,928 existing pieces of permissible and nonpermissible diesel-powered equipment, of which 2,878 are in large mines and 50 are in small mines. Of the 2,878 pieces in large mines, 542 are permissible pieces, 505 are nonpermissible heavy duty pieces, and 1,831 are nonpermissible light duty pieces. Of the 50 pieces in small mines, 25 pieces are permissible, 12 are nonpermissible heavy duty pieces, and 13 are nonpermissible light duty pieces.

Currently, examinations and tests are done in accordance with approved checklists and manuals about once a month (or 12 times per year). Thus, under current practices, the annual costs to perform examinations and tests in accordance with an approved checklist is $578,300, of which large mines will spend about $559,800 [((542 perm. pcs. x 2 hrs.) + (505 nonperm. heavy duty

pcs. x 0.5 hrs.) + (1,831 nonperm. light duty pcs. x 0.25 hrs.)) x 12 mos. x $26 wage] and small mines will spend about $18,500 [((25 perm. pcs. x 2 hrs.) + (12 nonperm. heavy duty pcs. x 0.5 hrs.) + (13 nonperm. light duty pcs. x 0.25 hrs.)) x 12 mos. x $26 wage].

Under this provision there will be an increase in examinations and tests from once a month to once a week. Thus, the total annual costs will be $2,394,150, of which large mines will incur about $2,332,525 [((542 perm. pcs. x 2 hrs.) + (505 nonperm. heavy duty pcs. x 0.5 hrs.) + (1,831 nonperm. light duty pcs. x 0.25 hrs.)) x 50 wks. x $26 wage] and small mines will spend about $61,625 [((25 perm. pcs. x 2 hrs.) + (12 nonperm. heavy duty pcs. x 0.5 hrs.) + (13 nonperm. light duty pcs. x 0.25 hrs.)) x 40 wks. x $26 wage].

The annual compliance costs will be the difference between the expected costs under this provision and costs associated with current practices. On that basis, the annual costs of compliance will be $1,815,850 ($2,394,150 - $578,300). Of the $1,815,850, large mines will incur about $1,772,725 ($2,332,525 - $559,800) and small mines will incur about $43,125 ($61,625 - $18,500).

Section 75.1914(f)(2) requires a record to be made for each weekly examination where a defect is found. The record must include machine examined, defect found, and corrective action taken. MSHA estimates that a defect will be found in about 25 percent of the examinations. Each record, including maintaining, is estimated to take 5 minutes (or 0.0833 hours) by a person

earning $26 per hour. Thus, MSHA estimates that compliance costs will be about $79,025, of which large mines will incur $77,975 [((542 perm. pcs. + 505 nonperm. heavy duty pcs. + 1,831 nonperm. light duty pcs.) x 0.25) x 0.0833 hrs. x $26 wage x 50 wks.] and; small mines will incur $1,050 [((25 perm. pcs. + 12 nonperm. heavy duty pcs. + 13 nonperm. light duty pcs.) x 0.25) x 0.0833 hrs. x $26 wage x 40 wks.].

Sections 75.1914(g)(1) through (5) require mine operators to develop and implement standard operating procedures for testing and evaluating undiluted diesel exhaust emissions for detecting carbon monoxide (CO). MSHA estimates that it will take 2 hours of supervisor time (valued at $37.35 per hour) to develop and maintain the testing procedures. Written procedures would be similar for diesel equipment that are of the same model, but would vary when the diesel machines are different models. On average, there can be 4 to 5 (for an average of 4.5) different models of diesel machines in large mines and; about 2 different models of diesel machines in small mines. This provision will affect all large and small mines that use diesel-powered equipment. Thus, the initial compliance costs to develop and write procedures for the testing and evaluating of undiluted exhaust emissions will be about $55,375, of which large mines will incur about $53,125 [$37.35 wage x 4.5 models x 2 hrs. x 158 mines] and small mines will incur about $2,250 [$37.35 x 2 models x 2 hrs. x 15 mines]. The $55,375 was annualized at 7 percent to be $3,900, of which large mines will incur about

$3,725 [$53,125 x 0.07] and small mines will incur about $175 [$2,250 x 0.07].

There are no compliance costs for training because MSHA assumes that the same individual(s) who perform area sampling requirements of § 70.1900 can perform the tests required by this section. However, there will be compliance costs for all large and small mines concerning equipment that needs to be purchased in order to conduct the undiluted exhaust emission test. MSHA estimates that large and small mines will need to purchase one instantaneous gas analyzer device which provides a CO reading instantaneously. Even though these devices were purchased by mines under § 70.1900(b)(1) and (b)(2) operators will have to purchase an additional device because the ones purchased to perform area sampling are designed to measure lower concentrations of the subject gases than will be read by the device measuring undiluted exhaust gas under this provision. The cost of the device, as noted in § 70.1900(b)(1) and (b)(2) is $1,475. Thus, the initial compliance cost to purchase equipment under this section will be about $255,175, of which large mines will incur $233,050 [158 mines x 1 device x $1,475] and small mines will incur about $22,125 [15 mines x 1 device x $1,475]. The $255,175 is annualized over 10 years to be $36,250, of which large mines will incur about $33,100 [$233,050 x 0.142] and small mines will incur about $3,150 [$22,125 x 0.142].

In addition, to purchasing the equipment the devices will have to be maintained and calibrated. Similar to § 70.1900(b)(1)

and (b)(2) maintenance and calibration will consist of changing a battery pack once every two years (per year cost is $40), replacing a sensor at least once a year (costing $200), and purchasing a 103 liter bottle of CO gas needed for calibrations, which costs about $105. Thus, the annual compliance costs for maintenance and calibration of the instantaneous gas analyzer will be about $59,700, of which large mines will incur about $54,525 [($40 + $200 + $105) x 1 device x 158 mines] and small mines will incur about $5,175 [($40 + $200 + $105) x 1 device x 15 mines].

Further, there will be annual compliance costs related to the time that it takes to test for undiluted exhaust emissions. Paragraph (g) requires that all permissible and heavy duty diesel-powered equipment be tested. With respect to the 567 permissible pieces of equipment, 542 pieces are in large mines and 25 pieces are in small mines. Concerning the 517 heavy duty pieces of equipment, 505 pieces are in large mines and 12 pieces are in small mines. Therefore, about 1,047 permissible and heavy duty pieces of equipment in large mines and 37 permissible and heavy duty pieces of equipment in small mines, will be tested. MSHA estimates that it will take about 10 minutes (0.1667 hours) per machine to complete the test. The 10 minutes includes set up time which consist of making sure the machine is running at normal operating temperature and then conducting the test. The weekly tests will be performed by a person earning $31 per hour. Thus, MSHA estimates that the annual costs related to the time to

take the test will be about $278,175, of which large mines will incur $270,525 [1,047 pcs. x 50 wks. x (0.1667 hrs. x $31 wage)] and small mines will incur $7,650 [37 pcs. x 40 wks. x (0.1667 hrs. x $31 wage)].

Further, paragraph (g)(5) requires that records be kept concerning the weekly exams and tests of the undiluted exhaust emissions on all pieces of diesel-powered equipment tested. As noted above 1,047 permissible and heavy duty pieces in large mines and 37 permissible and heavy duty pieces in small mines will be tested weekly and thus a record created. MSHA estimates that it will take about 5 minutes (0.0833 hours) to make and maintain a record for each piece of equipment. Based on a labor rate of $31 per hour, the annual compliance costs for recordkeeping under paragraph (g)(5) will be about $139,025, of which large mines will incur about $135,200 [1,047 pieces x 0.0833 hrs. x $31 wage x 50 wks.] and small mines will incur about $3,825 [37 pieces x 0.0833 hrs. x $31 wage x 40 wks.].

Section 75.1914(h) states the manner in which records are to be kept. The compliance costs related to records are contained above in the specific 75.1914 provisions that they apply to.

Section 75.1915 - Training and Qualification of Persons Working on Diesel Equipment.

This section contains requirements for qualifying a person to work on diesel-powered equipment. MSHA inspectors report that engine and equipment manufacturers visit mines and instruct mine operators, mechanics, etc., in the proper maintenance and

operations of their diesel-powered equipment, and also, conduct local training seminars, and sales promotions. Consequently, mine operators are indirectly incurring part of training costs when they purchase diesel equipment. MSHA expects these equipment manufacturer instructional sessions to continue and be minimally affected by this section because manufacturers can easily adopt this requirement into their instructional sessions.

The total initial costs for this section will be $2.22 million, of which large and small mines will incur about $2.20 million and $21,425, respectively. The total annualized costs will be $155,475, of which large and small mines will incur about $153,925 and $1,550, respectively. The total annual costs will be $418,525, of which large and small mines will incur $418,400 and $125, respectively. The majority of the costs are associated with § 75.1915(a), which concerns putting into action the training and qualification program.

Section 75.1915(a) requires a person to successfully complete a training and qualification program which meets the requirements of paragraph (b)(1) through paragraph (b)(5).

Paragraph (b)(5) requires the development of a written training program which includes a description of the course content, materials, and teaching methods for initial training and retraining. Paragraph (c) states the manner in which records are to be kept. MSHA determined that it will take a mine supervisor earning $37.35 per hour about 16 hours in a large mine and about 10 hours in a small mine to develop and maintain such a training

and qualification program. The initial costs for developing and maintaining a training program will be $100,025, all of which are a one time cost. Of the $100,025, large mines will incur about $94,425, [158 mines x 16 hrs. x $37.35] and small mines will incur about $5,600 [15 mines x 10 hours x $37.35]. The $100,025 was annualized at 7 percent to be about $7,000, of which large and small mines will incur about $6,625 [$94,425 x 0.07] and $400 [$5,600 x 0.07], respectively.

After the first year, the costs for developing and maintaining a training program will decrease because only mine that introduce diesel-powered equipment into their mine will need to develop and maintain a training program. MSHA estimates that 5 large mines (each year), and 1 small mine (every three years), will introduce diesel-powered equipment into their mine. Thus, the annual costs, after the first year, will be about $3,125, of which large mines will incur about $3,000, [5 mines x 16 hrs. x $37.35] and small mines will incur about $125 [(1 mines x 10 hours x $37.35)/3].

Part of the training program noted in paragraph (a) will consist of on the job and/or classroom type training. MSHA expects that each new mechanic will be trained for an average of 5 hours on each type of diesel-powered equipment that requires training. MSHA assumes that training will be provided by an instructor, who is a supervisory person. MSHA determined that, on average, there are 8 different kinds of diesel equipment which will require training in a large mine and 2 in a small mine.

MSHA determined that an average of 10 mechanics at large mines and 1 to 2 (for an average of 1.5) mechanics at small mines will receive diesel equipment training. Based upon a wage rate of $26 per hour for a mechanic and $37.35 per hour for a supervisor, the initial cost for receiving initial training in accordance with paragraph (a) will be $1,890,725, all of which is a one time cost. Of the $1,890,725, large mines will incur about $1,879,250 [((5 hrs. x 8 types x $26 wage x 10 mechanics) + (5 hrs. x 8 types x $37.35 wage)) x 158 mines] and; small mines will incur $11,475 [((5 hrs. x 2 types x $26 wage x 1.5 mechanics) + (5 hrs. x 2 types x $37.35 wage)) x 15 mines]. The $1,890,725 was annualized at 7 percent to be about $132,350, of which large mines will incur about $131,550 [$1,879,250 x 0.07] and small mines will incur about $800 [$11,475 x 0.07]. In addition, due to worker turnover, an average of 1 new mechanic annually in each large mine is estimated to take the initial training program annually. Thus, the annual training cost related to mechanic turnover at large mines will be about $400,375 [((5 hrs. x 8 types x $26 wage x 1 mechanic) + (5 hrs. x 8 types x $37.35 wage)) x 158 mines].

Also, as part of the training program noted in paragraph (a) mine operators will initiate a written and/or hands on test. The cost to develop the written and/or hands on test is included in the cost determination in paragraph (b)(5). MSHA estimates that the time required to administer and take a written and/or hands on test will be about 1.5 hours in a large mine and about

30 minutes in a small mine. The dollar amount for lost labor time of the miners, due to taking the test, will be about $390 [$26 wage x 1.5 hrs. x 10 mechanics] at a large mine and about $20 [$26 wage x 30/60 x 1.5 mechanic] at a small mine. In addition, an instructor earning a supervisory wage rate will administer the exam, the dollar amount of lost supervisory labor time will be about $56 [$37.35 wage x 1.5 hrs.] in a large mine and about $18 [$37.35 wage x 30/60] in a small mine. The initial costs for taking the written and/or hands on test will be $71,050, all of which are a one-time cost. Of the $71,050, large mines will incur about $70,475 [($390 + $56) x 158 mines] and small mines will incur about $575 [($20 + $18) x 15 mines]. The $71,050 was annualized at 7 percent to be about $5,000, of which large and small mines will incur about $4,950 [$70,475 x 0.07] and $50 [$575 x 0.07], respectively. In addition, due to employee turnover an average of 1 mechanic in each large mine will need to take the initial written and/or hands on test, annually. Thus, the annual costs for giving such a yearly test at large mines will be about $15,025 [((1.5 hrs. x $37.35 x 1 supervisor) + (1.5 hrs. x $26 x 1 mechanic)) x 158 mines].

Further, paragraph (a) also encompasses retraining. The final rule, however, does not mandate retraining at specified intervals. MSHA has concluded that each mine operator should tailor its retraining to the conditions and practices at each mine to ensure that all persons who work on diesel-powered equipment maintain the requisite level of expertise. With

respect to receiving retraining, MSHA assumes that it will be implemented every three years and take an average of 30 minutes of labor per type of diesel equipment for a mechanic to receive the retraining. Thus, retraining per mechanic will take 4 hours [30 minutes x 8 types] at large mines and 1 hour [30 minutes x 2 types] at small mines. The retraining may take the form of a discussion session or demonstration of abilities required that will be given by a person earning a supervisor wage of $37.35 per hour. Since, the first retraining will not take place until three years after the introductory training noted in paragraph (a) is given, the initial retraining costs determined below are multiplied by a net present value factor of 0.816. This net present value figure reflects the fact that because of inflationary factors, dollars spent in the future are not as valuable as those spent today. The retraining program costs will be about $157,050. Of the $157,050, large mines will incur about $153,300 [((4 hrs. x 10 mechanics x $26 wage) + (4 hrs. x $37.35 wage)) x 158 mines x 0.816] and; small mines will incur about $3,750 [((4 hrs. x 1.5 mechanics x $26 wage) + (4 hrs. x $37.35 wage)) x 15 mines x 0.816]. The $157,050 was annualized at 7 percent to be $11,025, of which large mines will incur $10,750 [$153,300 x 0.07] and small mines will incur $275 [$3,750 x 0.07].

With respect to § 75.1915(a), total initial costs will be about $2.11 million, of which large and small mines will incur about $2.10 million and $15,800, respectively. The total

annualized costs will be $148,375, of which large and small mines will incur about $147,250 and $1,125, respectively. The total annual costs will be about $415,400 which will all be incurred by large mines.

Sections 75.1915(b)(1) through (b)(4) lists requirements that must be included in a written training and qualification program. The compliance costs associated with these provisions have been calculated above as part of the costs of developing a training program in § 75.1915(b)(5).

Section 75.1915(c) states the manner in which records are to be kept. The compliance costs related to records are contained above in the specific 75.1915 provisions that they apply to.

Section 75.1916 - Traffic Rules for Diesel-Powered Equipment

This section addresses speed limits and other traffic restriction on roadways where diesel-powered equipment is operated. The total initial costs are $61,200, of which large mines will incur $59,000 and small mines will incur $2,200. The total annualized costs are $ 8,725, of which large and small mines will incur $8,400 and $325, respectively.

Sections 75.1916(a) and (b) require that diesel-powered equipment be operated at a speed that is consistent with the type of equipment being operated, roadway conditions, grades, clearances, visibility and other traffic. Further, operators of mobile diesel-powered equipment shall have full control of the machine while it is in motion. Such requirements are either

current industry practice, or consist of negligible or no costs. Thus, there are no compliance costs determined for these provisions.

Section 75.1916(c) requires that a mine have standardized traffic warning signs. MSHA estimates that approximately 75 percent of all mines (118 large mines and 11 small mines) do not have standardized warning signs or would have to change existing signs in order to come into compliance with the rule as it concerns diesel-powered equipment. On average it is estimated that a large mine will require 10 signs and a small mine will require 4 signs. A traffic sign constructed with reflective sheeting on aluminum will costs on average about $50 per sign.

The initial cost for standardized traffic signs will be $61,200, of which large and small mines will incur about $59,000 [$50 x 10 signs x 118 mines] and $2,200 [$50 x 4 signs x 11 mines], respectively. The $61,200 was annualized over a 10 year period to be $8,725, of which large and small mines will incur about $8,400 ($59,000 x 0.142) and $325 (2,200 x 0.142), respectively.

Sections 75.1916(d) and (e) require that except as required in normal mining operations, mobile diesel-powered shall not be idled and that diesel-powered equipment must not be operated unattended. These provisions are working practices and there are no compliance costs.

OTHER ISSUES UNDER PART 75

In the proposed rule, under the heading "Other Issues Under 30 CFR part 75," MSHA identified a number of sections in existing part 75 that might require amendment to make them applicable to diesel-powered equipment. Specifically, these sections were §§ 75.313, 75.400, 75.400-2, 75.523, 75.523-1, 75.523-2, 75.1710, and 75.1710-1. The final rule does not affect all of these sections. Below is a discussion of those sections mentioned as "other issues" that are affected by this final rule.

Section 75.342 requires methane monitors on certain diesel-powered equipment noted in § 75.342(a)(1). The requirements in this section replaced § 75.313 that was mentioned in the proposed diesel rule. There are no compliance costs for this section because the diesel-powered equipment which will require a methane monitor by this rule are already so equipped by industry practice.

Sections 75.1710 and 75.1710-1 require that (except as provided for in paragraph (f) of § 75.1710-1) all self-propelled diesel-powered face equipment that is employed in the active workings of each underground coal mine be equipped with substantially constructed canopy or cab. In addition, paragraph (e) requires that evidence be attached to the cab or canopy confirming that it has been substantially constructed and written evidence concerning such confirmation be maintained. There are no compliance costs because the diesel-powered equipment which will require cabs or canopies by this provision

are already equipped with such equipment and mine operators are currently complying with the requirements noted in paragraph (e).

Section 75.400 requires that coal dust, loose coal, and other combustible materials, be cleaned up and not be permitted to accumulate on diesel-powered equipment. There are no compliance costs associated with this section because equipment clean up, regardless of the power source of the machine, is a current work practice. Section 75.400-2 requires that a program for regular clean up and removal of accumulation of coal and float coal dusts, loose coal, and other combustibles be established and maintained. The program must be available to the Secretary or authorized representative. Since § 75.400 already applies to diesel-powered equipment, this equipment would be covered under any requirement for a clean up program in existing § 75.400-2. Thus, there are no compliance costs.

Sections 75.523-1&2 require the installation of panic bars on permissible equipment. Currently diesel-powered face equipment is provided with operator compartments that are substantially constructed and provided with a canopy which meets § 75.1710-1 requirements. Thus, protection for equipment operators has been furnished equal to the protection that a panic bar would provide. In addition, § 523-3 requires automatic emergency parking brakes on diesel-powered equipment. The cost and applicable requirements for this are addressed in § 75.1909.

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V. REGULATORY FLEXIBILITY ANALYSIS

INTRODUCTION

The Regulatory Flexibility Act (Reg Flex Act) requires that agencies evaluate proposed and final rules to determine the regulatory impact on small entities and to ensure that all regulatory alternatives have been analyzed so that the published rules maximize flexibility for small entities. In compliance with the Regulatory Flexibility Act, MSHA has crafted a final rule to meet the Regulatory Flexibility Act's requirements.

LEGAL BASIS FOR FINAL RULE

This final rule is being issued by MSHA in accordance with section 101 of the Federal Mine Safety and Health Act of 1977 (30 U.S.C. 811) (Mine Act). Specifically, this final rule will address Congress' intent that the Mine Act protect miners and other persons from hazards on mine property.

THE FINAL RULE'S ECONOMIC IMPACT

The final rule establishes comprehensive requirements governing the use of diesel-powered equipment in underground coal mines. The final rule does this by addressing fire, explosion and other hazards of diesel machines; the storage, transportation and dispensing of diesel fuel underground; maintenance of the equipment; and emission hazards from diesel engines. As a result, the per year cost of the rule for large and small mine

operators will be $10.1 million and $210,800, respectively. On an average basis, the per year cost of the final rule on a large mine will be approximately $63,925 and $14,100 for a small mine. The requirements in this rule will decrease the chances of a fire or explosion in an underground coal mine that can be caused by a piece of diesel machinery and minimize the severity in the event that a fire would occur. The possible financial loss of machinery and production from a diesel machine fire can substantially outweigh the annual cost per mine of this final rule. For example, a diesel fire that destroys a permissible heavy duty diesel machine could cost $250,000 just to replace the machine. Nonpermissible light duty diesel machines cost, on average, about $60,000. The financial loss to a mine operator could quickly escalate in a large mine if a diesel fire spreads throughout the mine. A large mine could have 20 or 30 permissible diesel machines and as much as 100 nonpermissible diesel machines. Although small mines generally tend to have few pieces of diesel-powered equipment, replacement costs of even one permissible heavy duty machine could have a major financial impact on a small mine. In addition, the financial damage from a diesel-powered equipment fire can be greater that just the cost of the machine. For example, on December 29, 1983, a Wagner diesel-powered utility truck caught on fire at the Emery Mining Corporation's Beehive Mine in Utah. The Beehive Mine was a small underground coal mine employing fewer than 10 people. The diesel fire rapidly spread throughout the mine resulting in the closure

of the entire mine and the loss of annual coal production revenues of $3.1 million. Also, in the event that a diesel fire causes injury or death, a mine operator could face significant legal costs.

Requirements in the final rule not only serve to prevent fires on diesel machines but also increase the productive usage of such equipment. For example, requirements in § 75.1914 concerning the maintenance of diesel-powered equipment, such as flushing water scrubbers after shift and weekly inspections of diesel machinery, will ensure that diesel-powered equipment does not deteriorate through neglect or abuse. Machine defects or malfunctions that are not discovered and corrected could result in increased machine down time and decrease the life of the machine.

Mine operators may be able to lessen the impact of the compliance costs of this final rule, because the effective date of certain provisions is delayed to reduce the economic impact of the rule. This will reduce the disruption of mine operators management of equipment inventory. During this period mine operators will have the choice of whether to incur immediate modification costs for existing pieces of diesel-powered equipment, or forego such modifications and replace worn out equipment with new equipment when the delayed provisions become effective. The time frames in the final rule were established after careful consideration of the useful life of diesel-powered equipment and components, in order to lessen the financial burden

of the requirements of the final rule.

The compliance costs of the final rule are not expected to have a significant negative impact upon current use of diesel-powered equipment or upon its rate of growth. Although, in the short run the rule increases the cost of using diesel-powered equipment, it also enhances the safety and health aspects concerning the use of the equipment, which in the long run is expected to increase the usefulness of such equipment in the underground coal mining environment.

IMPACT ON SMALL MINES

The final rule will not have a significant impact upon small mines. The rule will affect only underground coal mines that use diesel-powered equipment. The 173 underground coal mines that currently use diesel-powered equipment and are affected by the final rule account for only 16 percent of all underground coal mines (173 mines / 1,072 mines). Most underground coal mines that use diesel-powered equipment are large mines that employ 20 or more miners. Of the 173 mines, noted above, only 15 are small mines that employ 19 or fewer miners. Thus, less than 2 percent of all underground coal mines affected by this rule are small mines. In addition, of the final rule cost impact of $10.3 million on mine operators only $210,800 is related to small mine operators. Further, generally, small underground coal mines that use diesel-powered equipment are not likely to have underground diesel fuel storage facilities, thus, the regulations

in the final rule that concern such facilities will not apply to most small mines.

A diesel-powered machine poses the same fire and explosion safety and health hazards that have been discussed in this analysis, whether the equipment is in a small or large mine. Whether the mine is small or large, the diesel-powered equipment used underground has the same ignition and fuel sources that are hazardous and the same combustible materials (i.e., coal dust and methane). Thus, the safety and health hazards of diesel-powered equipment need to be addressed regardless of mine size. The regulations of the final rule will help to ensure that diesel-powered equipment in small underground coal mines operate in a manner which reduces the chances of such equipment causing a fire or explosion.

Significant Alternatives

The Regulatory Flexibility Analysis Act requires agencies which are developing regulatory rules to evaluate and include, whenever possible, compliance alternatives that minimize the adverse impact on small businesses when developing regulatory standards.

Although this final rule was proposed in October 1989 before the Small Business Regulatory Enforcement Fairness Act of 1996, the impact upon small mines was a consideration in the development of the final rule. The final rule will not significantly affect small mines because most diesel-powered

equipment is found in large mines and such equipment is not generally found in small underground coal mines. In addition, small mines that do have diesel-powered equipment do not have large numbers of such equipment. However, in developing the final rule, alternatives were chosen with the objective of implementing the rules standards while minimizing the burden to mines, including small mines. For example, various safety requirements of the rule were purposely written to be performance based standards, so that mine operators could choose the most economic way to implement the requirement as it concerns their specific mine situations. Requirements for sampling certain toxic gases established in the rule are integrated into the existing sampling practices of mine operators. The number of inspections of undiluted diesel exhaust required by the rule and various recordkeeping provisions were substantially reduced from the proposed rule. Even though the final rule's impact upon small mines is not significant, the paperwork burden imposed on small mines has been reduced when compared to the proposed rule.

RECORDKEEPING

In accordance with the Regulatory Flexibility Act and the Paperwork Reduction Act of 1995, MSHA has analyzed the paperwork burden for mines, including small mines. MSHA estimates that the final rule will result in net paperwork burden hours to manufacturers of 558 hours, of which 790 hours are related to new burden hours required under part 7, subparts E and F, and

232 hours are related to decreased burden hours related to existing parts 36 and 32. In the first year the final rule is in effect the burden hours on mine operators will be 56,258, of which large and small mine operators will incur 54,774 and 1,484 hours. After the first year, the burden hours to mine operators will be 52,228, of which large and small mine operators will incur 50,949 and 1,279 hours. The total new paperwork burden hours to mine operators and manufacturers, in the first year the final rule becomes effective, will be 56,816 [56,258 + (790 - 232)]. After the first year, the total new paperwork burden hours to mine operators and manufacturers will be 52,786 [52,228 + (790 - 232)]. The bulk of the burden hours are related to making records which concern inspections of diesel-powered machinery, fire suppression systems and undiluted diesel exhaust emissions. These recordkeeping requirements have been substantially reduced from the proposed rule, thereby, lessening the burden impact to small mines. Part VII of this analysis contains an explanation of how paperwork burden hours and related costs were determined for each final rule provision that has a paperwork requirement.

REGULATORY RELIEF

While MSHA has not exempted small mine operators from any provision of the final rule, the requirements have been designed to minimize the burden imposed on the industry. As noted above, the cost impact on small mine operators is very small. Of the

$10.3 million per year cost to underground coal mine operators, only about 2 percent ($210,800) is related to small mines, representing less than 1 percent of the value of mine production for small underground coal mines.

VI. UNFUNDED MANDATES REFORM ACT OF 1995

The Unfunded Mandates Reform Act of 1995 requires Federal agencies to: (1) develop a process to permit state, local, and tribal governments to provide input to the rule making process and; (2) prepare estimates of the budgetary impact of regulations on state, local, and tribal governments and the private sector before adopting such regulations. MSHA's rule making process for this rulemaking comports with these requirements.

On October 4, 1989 MSHA issued a proposed rulemaking for 30 CFR parts 7, 70, and 75 "Approval Requirements for Diesel-powered Machines and Approval, Exposure Monitoring, and Safety Requirements for the Use of Diesel-Powered Equipment in Underground Coal Mines; Proposed Rules". The Agency received approximately 200 responses, none of which came from state or local governments.

For purposed of the Unfunded Mandates Reform Act of 1995, as well as Executive Order No. 12875, this rule does not include any federal mandate that may result in increased expenditures by either state, local and tribal governments in the aggregate, or increased expenditures of more than $100 million by the private sector.

VII. PAPERWORK REDUCTION ACT OF 1995

INTRODUCTION

The final rule contains information collection requirements in part 7, subpart E and F, and in §§ 75.363, 75.370, 75.1901, 75.1904, 75.1911, 75.1912, 75.1914, and 75.1915. In addition, the final rule eliminates information collection requirements that are associated with part 32, and 36. Those required to provide the information are the mine operators that use diesel-powered equipment in their mines and manufacturers of diesel-powered engines and power packages. Costs for engine and power package tests required under part 7 and performed by third parties is shown, however, burden hours to manufacturers are not associated with third party testing. The following provides the details of how the burden hours and costs related to those burden hours were determined.

PART 7 - SUBPART E - (PERMISSIBLE ENGINE MODELS)

Section 7.83 Currently, manufacturers file applications seeking approval from MSHA for new permissible engine models under existing part 36 regulations. As part of this approval process, a maximum fuel/air ratio test and a gaseous ventilation test is performed. As a result of the final rule, manufacturers will now file applications for approval of new permissible engine models under part 7, subpart E, instead of part 36.

MSHA estimates that it will take about 43 burden hours, at a rate of $75 per hour, for manufacturers to prepare and submit the application related to the maximum fuel/air ratio test and the gaseous ventilation rate test for a new permissible engine model. The application costs are not new to manufacturers.

Annual Burden Hours For Part 7, Subpart E, §7.83
For New Permissible Engine Model Applications

1.5 applications per year seeking approval for new permissible engine models x 43 hours = **65 hours**

Annual Cost For Part 7, Subpart E, §7.83
For New Permissible Engine Models Applications

1.5 applications per year seeking approval for new permissible engine models x 43 hours x $75 per hour = **$4,838**

SECTIONS 7.87 and 7.88 The promulgation of part 7 in the final rule will allow manufacturers to have the maximum fuel/air ratio test and the gaseous ventilation test for a new permissible engine model to be performed by a third party. Under the final rule, the maximum fuel/air ratio test is required by § 7.87 and the gaseous ventilation test is required by § 7.88.

MSHA estimates the cost to have these tests done on a new permissible engine model to be about $10,000. This is not a new cost incurred by manufacturers under part 7, subpart E, because these tests were formally performed under existing part 36.

Annual Cost to Perform Tests for New Permissible
Engine Models Required by §§7.83 and 7.87

1.5 applications per year for new permissible engine models X $10,000 = **$15,000**

PART 7 - SUBPART E - (PERMISSIBLE ENGINE MODELS) - continued

Sections 7.83 New permissible engine models approved under part 7, subpart E will need an additional test to determine the particulate index of the engine model. This test is not required under existing part 36 regulations. Thus, there will be an increase in the burden to manufacturers under part 7, subpart E, when the testing for the particulate index is conducted for new permissible engine models.

The paperwork required by manufacturers regarding the particulate index test for new permissible engine models can be attached to the application for new permissible engine models filed concerning the maximum fuel/air ratio and gaseous ventilation tests. However, an additional 30 minutes (0.5 hours) will be needed to record particulate test information on the application. The per hour rate to record such information is estimated to be $75.

Annual Burden Hours For Part 7, Subpart E, §7.83 For Particulate Index Test For New Permissible Engine Model Applications

1.5 applications per year seeking approval for new permissible engine models x 0.5 hours = **1 hour**

Annual Cost for Part 7, Subpart E, §7.83 For Particulate Index Test for New Permissible Engine Model Applications

1.5 applications per year seeking approval for new permissible engine models x 0.5 hours x $75 per hour = **$56**

SECTION 7.89 The promulgation of part 7 in the final rule will allow manufacturers to have the particulate index test for a new permissible engine model to be performed by a third party. Under the final rule, the particulate index test is required by § 7.89.

MSHA estimates that a particulate index test for a new permissible engine model that is already set up to run a maximum fuel/air ratio test and gaseous ventilation test will cost about $4,000. The particulate index test is not currently required under existing part 36 regulations and thus is a new cost to manufacturers.

Annual Cost to Perform Particulate Index Test for New Permissible Engine Models Required by §7.89

1.5 applications per year for new permissible engine models X $4,000 = **$6,000**

PART 7 - SUBPART E
NONPERMISSIBLE ENGINE MODELS WITH PART 32 APPROVAL

Section 7.83 Currently, manufacturers file applications seeking MSHA approval for nonpermissible engine models under existing part 32 regulations. As part of this approval process a maximum fuel/air ratio test and a gaseous ventilation test is performed. As a result of the final rule, manufacturers will need to file applications for approval of new nonpermissible engine models under part 7, subpart E, rather than part 32.

MSHA estimates that it will take about 34 burden hours, at a rate of $75 per hour, for manufacturers to prepare and submit the application related to the maximum fuel/air ratio test and the gaseous ventilation rate test for a new nonpermissible engine model. The application costs are not new to manufacturers.

Annual Burden Hours For Part 7, Subpart E - §7.83
For New Nonpermissible Engine Model Applications

2.5 applications per year seeking approval for new nonpermissible engine models x 34 hours = **85 hours**

Annual Cost For Part 7, Subpart E - §7.83
For New Nonpermissible Engine Model Applications

2.5 applications per year seeking approval for new nonpermissible engine models x 34 hours x $75 per hour = **$6,375**

SECTIONS 7.87 and 7.88 The promulgation of part 7 of the final rule will allow manufacturers to have the maximum fuel/air ratio test and the gaseous ventilation test for a new nonpermissible engine model to be performed by a third party. Under the final rule, the maximum fuel/air ratio test is required by § 7.87 and the gaseous ventilation test is required by § 7.88.

MSHA estimates the cost to have these tests done on a new permissible engine model to be about $10,000. This is not a new cost incurred by manufacturers under part 7, subpart E. The tests were formally conducted under existing part 36.

Annual Cost to Perform Tests for New Nonpermissible
Engine Models Required by §§7.83 and 7.87

2.5 applications per year for new nonpermissible engine models X $10,000 = **$25,000**

PART 7 - SUBPART E
NONPERMISSIBLE ENGINE MODELS WITH PART 32 APPROVAL - CONTINUED

Sections 7.83 New nonpermissible engine models approved under part 7, subpart E will need an additional test to determine the particulate index of the engine model. This test was not required under part 32 regulations. Thus, there will be an increase in the burden to manufacturers under part 7, subpart E, when the particulate index testing is conducted for new nonpermissible engine models.

The paperwork required by manufacturers regarding the particulate index test for new nonpermissible engine models can be attached to the application for new nonpermissible engine models filed concerning the maximum fuel/air ratio and gaseous ventilation tests. However, an additional 30 minutes (0.5 hours) will be needed to record particulate test information on the application. The per hour rate to record such information is estimated to be $75.

Annual Burden Hours For Part 7, Subpart E, §7.83 For Particulate Index Test For New Nonpermissible Engine Model Applications

2.5 applications per year seeking approval for new nonpermissible engine models x 0.5 hours = **1 hour**

Annual Cost For Part 7, Subpart E, §7.83 For Particulate Index Test for New nonpermissible Engine Model Applications

2.5 applications per year seeking approval for new permissible engine models x 0.5 hours x $75 per hour = **$94**

SECTION 7.89 The promulgation of pat 7 of the final rule will allow manufacturers to have the particulate index test for a new nonpermissible engine model to be performed by a third party. Under the final rule, the particulate index test is required by § 7.89.

MSHA estimates that a particulate index test for a new nonpermissible engine model that is already set up to run a maximum fuel/air ratio test and gaseous ventilation test will cost about $4,000. The particulate index test is not currently required under part 32 regulations and thus is a new cost to manufacturers.

Annual Cost to Perform Particulate Index Test for New Nonpermissible Engine Models Required by §7.89

2.5 applications per year for new permissible engine models X $4,000 = **$10,000**

PART 7 - SUBPART E
NONPERMISSIBLE ENGINE MODELS WITH PART 32 APPROVAL - CONTINUED

Sections 7.83 Under part 7, subpart E, existing nonpermissible engine models previously approved under part 32, will need a particulate index test. This test was not required under part 32 regulations. Thus, there will be an increase in the burden to manufacturers under part 7, subpart E, when testing for the particulate index is conducted for existing nonpermissible engine models.

Since the application for existing nonpermissible engine models has already been filed, an amended or even a new application detailing the particulate index test will be required. MSHA estimates that it will take about 5 burden hours, at a rate of $75 per hour, for manufacturers to prepare and submit the application related to the particulate index test for an existing nonpermissible engine model that has part 32 approval. Application costs are annualized at a 7 percent rate.

Burden Hours For Part 7, Subpart E, §7.83
for a Particulate Index Test for
Existing Nonpermissible Engine Model Applications

16 applications per year seeking approval
for existing nonpermissible engine models
x 5 hours = **80 hours**

One Time Cost for Part 7, Subpart E, §7.83
For Particulate Index Test for
Existing Nonpermissible Engine Model Applications

16 applications per year seeking approval
for existing nonpermissible engine models
x 5 hours x $75 per hour x 0.07 = **$420**

SECTION 7.89 The promulgation of part 7 of the final rule will allow manufacturers to have the particulate index test for an existing nonpermissible engine model to be performed by a third party. Under the final rule, the particulate index test is required by § 7.89.

A particulate index test for existing engine models not already set up to run a maximum fuel/air ratio test and gaseous ventilation test is about $10,000, which includes time to set up and conduct the test. With respect to existing nonpermissible engine models, the cost of the particulate index test will occur only once. Thus, costs are annualized at a rate of 7 percent. The particulate index test is not currently required under part 32 regulations and thus is a new cost to manufacturers.

Annualized Cost to Perform Particulate Index Test for
Existing Nonpermissible Engine Models Required by §7.89

16 applications for existing nonpermissible engine
models x $10,000 x 0.07 = **$11,200**

PART 7 - SUBPART E
NONPERMISSIBLE ENGINE MODELS WITHOUT PART 32 APPROVAL

Section 7.83 Currently, there are nonpermissible engine models that lack part 32 approval but still are used in underground coal mines. MSHA estimates that 1 such existing nonpermissible engine model will be approved under part 7, subpart E.

This 1 existing nonpermissible engine model will incur burden hours for an application to be filed related to tests for a maximum fuel/air ratio; a gaseous ventilation rate; and a particulate index.

MSHA estimates that it will take about 34.5 burden hours at a rate of $75 per hour, for a manufacturer to prepare and submit the application related to all three tests for an existing nonpermissible engine model that lacks part 32 approval. The application costs are annualized at a rate of 7 percent.

Burden Hours For Part 7, Subpart E, §7.83 Application For an Existing Nonpermissible Engine Model Without Part 32 Approval

1 application for an existing nonpermissible engine model without part 32 approval x 34.5 hours = **35 hours**

One Time Costs For Part 7, Subpart E, §7.83 Application For an Existing Nonpermissible Engine Model Without Part 32 Approval

1 application for an existing nonpermissible engine model without part 32 approval x 34.5 hours x $75 per hour x 0.07 = **$181**

SECTION 7.89 Under the final rule the engines noted above will need a maximum fuel/air ratio test (required by § 7.87), gaseous ventilation test (required by § 7.88), and a particulate index test (required by § 7.89).

The promulgation of part 7 of the final rule will allow a manufacturer to have all three tests for an existing nonpermissible engine model lacking part 32 approval to be performed by a third party. The cost to conduct all three tests is $14,000. The costs are annualized at a rate of 7 percent, because they are associated with tests on an existing engine model. This is a new cost to manufacturers.

Annualized Cost to Perform all Three Tests for an Existing Nonpermissible Engine Model Required by §§7.87, 7.88, and 7.89

1 application seeking approval for existing nonpermissible engine model that lacks part 32 approval x $14,000 x 0.07 = **$1,000**

PART 7 - SUBPART E
NONPERMISSIBLE ENGINE MODELS WITHOUT PART 32 APPROVAL - continued

Section 7.83 MSHA estimates that a manufacturer will file an application annually to seek approval under part 7, subpart E, for a new nonpermissible engine model that lacks part 32 approval.

This one new nonpermissible engine model will incur burden hours for an application to be filed related to tests for a maximum fuel/air ratio; a gaseous ventilation rate; and a particulate index.

MSHA estimates that it will take about 34.5 burden hours at a rate of $75 per hour, for a manufacturer to prepare and submit the application related to all three tests for a new nonpermissible engine model that lacks part 32 approval. This is a new application costs to manufacturers.

Burden Hours For Part 7, Subpart E, §7.83 Application For a New Nonpermissible Engine Model Without Part 32 Approval

1 application for a new nonpermissible engine model without part 32 approval x 34.5 hours = **35 hours**

Annual Costs For Part 7, Subpart E, §7.83 Application For a New Nonpermissible Engine Model Without Part 32 Approval

1 application for a new nonpermissible engine model without part 32 approval x 34.5 hours x $75 per hour = **$2,587**

Section 7.83 Under the final rule the engines noted above will need a maximum fuel/air ratio test (required by § 7.87), a gaseous ventilation test (required by § 7.88), and a particulate index test (required by § 7.89).

The promulgation of part 7 of the final rule will allow a manufacturer to have all three tests for a new nonpermissible engine model lacking part 32 approval to be performed by a third party.

MSHA estimates that the cost to conduct all three tests is $14,000. This is a new cost to manufacturers.

Annual Cost to Perform all Three Tests for a New Nonpermissible Engine Model Required by §§7.87, 7.88, and 7.89

1 application seeking approval for a new nonpermissible engine model that lacks part 32 approval x $14,000 = **$14,000**

PART 7, SUBPART E,

Section 7.90 requires that a permanent and legible approval plate containing specific information be attached to new diesel-powered equipment by manufacturers. It is estimated to take about 10 minutes (0.1667 hours) to install a plate. The installation cost, which includes the time it takes to install the plate, will be about $2.90 per plate.

Installation Burden Hours:

20 new permissible diesel pieces per year x 0.1667 hours	=	**3 hours**
128 new nonpermissible diesel pieces per year x 0.1667 hours	=	**21 hours**
		24 hours

Installation Burden Hour Annual Costs:

20 new permissible diesel pieces per year x $2.90 per plate	=	**$58**
128 new nonpermissible diesel pieces per year x $2.90	=	**$371**
		$429

PART 7 - SUBPART F
NEW PERMISSIBLE POWER PACKAGES

Sections 7.97 Currently, manufacturers file applications for approval for new safety components systems (which are similar to power packages) under part 36. As a result of the promulgation of the final rule, applications for power packages will be filed under part 7, subpart F, instead of part 36.

MSHA estimates that manufacturers will file applications for between 1 to 2 (for an average of 1.5) power packages annually. MSHA estimates that it will take about 43 burden hours, at a cost of $75 per hour, for manufacturers to prepare and submit the application related to the power package for a permissible engine model. The application costs are not new to manufacturers.

Annual Burden Hours For Part 7, Subpart F, §7.97
For New Permissible Power Package Model Applications

1.5 applications per year seeking approval for new permissible power package models x 43 hours	=	**65 hrs.**

Annual Costs For Part 7, Subpart F, §7.97
For New Permissible Power Package Model Applications

1.5 applications per year seeking approval for new permissible power package models x 43 hours x $75 per hour	=	**$4,838**

Sections 7.100 through 7.104 The promulgation of part 7 of the final rule will allow manufacturers to have the tests on power packages for new permissible engine models to be performed by a third party. Under the final rule, these tests are required by § 7.100-Explosion Test, § 7.101-Surface Temperature Test, § 7.102-Exhaust Gas Cooling Efficiency Test, § 7.103-Safety System Control Test, and § 7.104-Internal Static Pressure Test.

MSHA estimates the cost to have these tests done on a power package for new permissible engine model to be about $20,000. This is not a new cost incurred by manufacturers because these tests are currently done when manufacturers file applications for approval of new safety components systems (which are similar to power packages) under existing part 36. The final rule requires manufacturers to have these tests done under part 7, subpart E, instead of under part 36.

Annual Costs For Part 7, Subpart F, Tests
For New Permissible Power Package Model
Tests Required by §§7.100 through 7.104

1.5 applications per year for new permissible power package models x $20,000	=	**$30,000**

PART 7 - SUBPART F
EXISTING PERMISSIBLE POWER PACKAGES

Sections 7.97 Certain safety component systems previously approved under part 36 could be used to comply with the requirements for a part 7, subpart F, power package if the manufacturer files with MSHA to request that the safety components system previously approved under part 36 now be approved under part 7, subpart F. MSHA estimates that this will affect about 33 existing safety component systems for which approvals will be required under part 7, subpart F. Results from tests done under existing part 36 could be used to fulfill a majority of the part 7, subpart F, requirements. However, additional testing is needed.

MSHA estimates that it will take about 12 hours, at a rate of $75 per hour, for manufacturers to prepare and submit the application related to the additional testing needed for the power packages for permissible engines. These applications are new to manufacturers but will need to be submitted one time only. Thus, the application costs are annualized at a rate of 7 percent.

One Time Burden Hours for Part 7, Subpart F, §7.97 for Modified Applications for Power Packages for Permissible Engine Models

33 existing power package applications
x 12 hours = **396 hrs.**

Annualized Costs for Part 7, Subpart F, §7.97 for Modified Applications for Power Packages for Permissible Engine Models

33 existing power package applications x 12 hours
x $75 per hour x 0.07 = **$2,079**

Sections 7.100 through 7.104

MSHA estimates that this will affect 33 existing safety components systems for which approvals will be needed under part 7, subpart F. Results from tests done under existing part 36 could be used to fulfill the majority of the part 7, subpart F, required by §§7.100 through 7.104. However, additional testing is required that will cost approximately $1,600. These costs will not reoccur annually, and thus, are annualized at a rate of 7 percent.

The promulgation of part 7 of the final rule will allow manufacturers to have the additional tests for these safety component systems on permissible engine models to be performed by a third party.

Annualized Costs For Part 7, Subpart F, For Additional Tests

33 existing power package applications
x $1,600 per power package application
x 0.07 = **$3,696**

PART 7, SUBPART F

Section 7.105 requires that a permanent and legible approval plate containing specific information be attached to new safety power packages that are placed on diesel- powered machines by manufacturers. It is estimated to take about 10 minutes (0.1667 hours) to install a plate. The installation cost, which includes the time it takes to install the plate, will be about $2.90 per plate.

Installation Burden Hours:

20 safety power packages placed on permissible diesel pieces x 0.1667 hours = **3 hours**

Installation Burden Hour Annual Costs:

20 safety power packages placed on permissible diesel pieces x $2.90 per plate = **$58**

Section 75.363 requires records to be made when the results of sampling in certain areas of the mine exceed an action level of 50 percent of the threshold value limit for concentrations of carbon monoxide and nitrogen dioxide. MSHA estimates that 100 large and 10 small mines are affected by this provision. Annually, each large mine will make 10 records and each small mine will make 10 records. It will take 10 minutes (0.1667 hours) in a large mine and 5 minutes (0.0833 hours) in a small mine to make and maintain the record, by an examiner earning $34.50 per hour.

As a result of this provision, mines will need to purchase equipment. Equipment costs for this provision are in question 13.

Burden Hour Time to Take the Samples:

100 large mines x 10 samples per year
x 0.0167 hours = **17** hours

10 small mines x 10 samples per year
x 0.0167 hours = **2** hours
19 hours

Recordkeeping Burden Hours:

100 large mines x 10 samples per year
x 0.1667 hours = **167** hours

10 small mines x 10 samples per year
x 0.0833 hours = **8** hours
175 hours

TOTAL INCREASED BURDEN HOURS FOR 75.363 19 + 175 = 194

Burden Hour Annual Costs Related to Burden Hour Time to Take Samples:

100 large mines x 10 samples per year
x 0.0167 hours x $34.50 wage] = **$576**

10 small mines x 10 samples per year
x 0.0167 hours x $34.50 wage] = **$ 57**
= **$633**

[Costs for equipment shown below under heading titled "Equipment Costs".]

Burden Hour Annual Cost Related to Recordkeeping Burden Hours:

100 large mines x 10 samples per year
x 0.1667 hours x $34.50 wage = **$5,751**

10 small mines x 10 samples per year
x 0.0833 hours x $34.50 wage = **$ 287**
$6,038

TOTAL INCREASED BURDEN COSTS FOR 75.363
$6,327 + $344 = $6,671

Sections 75.371(r), (kk), (ll), (mm), (nn), (oo), and (pp) provide that certain information required in §§ 75.325 and 70.1900 be recorded in the mine operator's ventilation plan required by existing § 75.370. MSHA estimates that the time required to record the additional information in the existing ventilation plan will be 20 minutes (0.3333 hours) in a large mine and 10 minutes (0.1667 hours) in a small mine. The information will be recorded by a mine supervisor earning $37.35 per hour.

Increase in Recordkeeping Burden Hours in Existing § 75.370

158 large mines x (0.3333 hrs.)	=	**52** hours
15 small mines x (0.1667 hrs.)	=	**3** hours
	=	**55** hours

Annual Costs Related to Increase in Recordkeeping Burden Hours in Existing § 75.370

158 large mines x (0.3333 hrs.) x $37.35 wage	=	**$1,975**
15 small mines x (0.1667 hrs.) x $37.35 wage	=	**$ 100**
	=	**$2,075**

Section 75.1901(a) requires that upon request the mine operator must provide to an authorized representative of the Secretary, evidence that the diesel fuel purchased for use in diesel-powered equipment underground meets the requirements in paragraph (a). The information requested in paragraph (a) is available on the purchase order when the mine operator purchases diesel fuel. MSHA estimates that mine operators purchase fuel once every two weeks. Further, MSHA estimates that half of all large and small mines do not keep on file gas purchasing orders. Thus, this provision will affect 79 (158 x 0.5) large mines and 8 (15 x 0.5) small mines. It is estimated to take 3 minutes (0.05 hours) to file the purchase order by a clerical person earning $10 per hour.

Burden Hour Time to File Away Statement

79 large mines x 25 weeks x 0.05 hours	=	**99** hours
8 small mines x 20 weeks x 0.05 hours	=	**8** hours
		107 hours

Burden Hour Annual Costs related filing statement

79 large mines x 25 weeks x 0.05 hours x $10 wage	=	**$1,000**
8 small mines x 20 weeks x 0.05 hours x $10 wage	=	**$ 100**
		$1,100

Section 75.1904(b)(4)(i) requires that diesel fuel tank connections be identified by conspicuous markings that specify the function. About 494 tanks in large diesel mines and 20 tanks in small diesel mines will need to be marked. It will take 2 minutes (0.0333 hours) to mark the connections at a wage rate of $26 per hour. The markings will last for 2 years and thus costs are annualized at 0.553.

Burden Hour Time to Mark Connections:

494 tanks in large mines x 0.0333 hours	=	**16** hours
20 tanks in small mines x 0.0333 hours	=	**1** hours
		17 hours

Burden Hour Annualized Costs Related to Time to Mark Connections

[494 tanks in large mines x (0.0333 hours x $26 wage) x 0.553]	=	**$236**
[20 tanks in small mines x (0.0333 hours x $26 wage) x 0.553]	=	**$ 10**
		$246

Sections 75.1911(i)&(j) when inspecting diesel machines a record is required to be made for each fire suppression system inspection where a defect was found. The record must include the machine examined, defect found, and corrective action taken. With respect to recordkeeping of the inspections required by § 75.1911 (i), MSHA estimates that 10% of the inspections will show a defect exists. Each record, including maintenance of the record, is estimated to take 5 minutes (0.0833 hours). Weekly inspections are estimated to take 15 minutes (0.25 hours) by a person earning $26 per hour; and manufacturer recommended inspections are estimated to take 1 hour based upon a $80 per hour inspection rate.

Inspection Burden Hour Time Related to Records from Weekly Inspections

(2,962 diesel pieces in large mines x 1 inspection per week x 50 weeks per year x 0.10 inspections finding defects) x 0.25 hours = **3,702** hours

(53 diesel pieces in small mines x 1 inspection per week x 40 weeks per year x 0.10 inspections finding defects) x 0.25 hours = **53** hours

Weekly Inspection Recordkeeping Burden Hours

(2,962 diesel pieces in large mines x 1 inspection per week x 50 weeks per year x 0.10 inspections finding defects) x 0.0833 hours = **1,234** hours

(53 diesel pieces in small mines x 1 inspection per week x 40 weeks per year x 0.10 inspections finding defects) x 0.0833 hours = **18** hours

Burden Hour Annual Costs Related to Inspection Burden Hour Time from Weekly Inspections

(2,962 diesel pieces in large mines x 1 inspection per wk. x 50 weeks per year x 0.10 inspections finding defects) x 0.25 hours x $26 wage = **$96,265**

(53 diesel pieces in small mines x 1 inspection per week x 40 weeks per year x 0.10 inspections finding defects) x 0.25 hours x $26 wage = **$1,378**

Burden Hour Annual Costs Related to Weekly Inspection Recordkeeping Burden Hours

(2,962 diesel pieces in large mines x 1 inspection per week x 50 weeks per year x 0.10 inspections finding defects) x 0.0833 hours x $26 wage = **$32,075**

(53 diesel pieces in small mines x 1 inspection per week x 40 weeks per year x 0.10 inspections finding defects) x 0.0833 hours x $26 wage = **$459**

75.1911(i)&(j) CONTINUED ON NEXT PAGE

Inspection Burden Hour Time Related to Records from Manufacturer Recommended Inspections

(2,962 diesel pieces in large mines x 2 inspections per year x 0.10 inspections finding defects) x 1 hour = **592** hours

(53 diesel pieces in small mines x 2 inspections per year x 0.10 inspections finding defects) x 1 hour = **11** hours

Manufacturer Recommended Inspection Recordkeeping Burden Hours

(2,962 diesel pieces in large mines x 2 inspections per year x 0.10 inspections finding defects) x 0.0833 hours = **49** hours

(53 diesel pieces in small mines x 2 inspections per year x 0.10 inspections finding defects) x 0.0833 hours = **1** hour

Burden Hour Annual Costs Related to Inspection Burden Hour Time for Manufacturer Recommended Inspections

(2,962 diesel pieces in large mines x 2 inspections per year x 0.10 inspections finding defects) x 1 hour
x $80 inspection rate per hour = **$47,392**

(53 diesel pieces in small mines x 2 inspections per year x 0.10 inspections finding defects) x 1 hour
x $80 inspection rate per hour = **$848**

Burden Hour Annual Costs Related to Manufacturer Recommended Inspection Recordkeeping Burden Hours

(2,962 diesel pieces in large mines x 2 inspections per year x 0.10 inspections finding defects) x 0.0833 hours
x $80 inspection rate per hour = **$3,947**

(53 diesel pieces in small mines x 2 inspections per year x 0.10 inspections finding defects) x 0.0833 hours
x $80 inspection rate per hour = **$70**

75.1911(i)&(j) CONTINUED ON NEXT PAGE

75.1911(i)&(j) CONTINUED

Weekly Inspection and Record Burden Hours		
Large mines (3,702 + 1,233)	**=**	**4,935 hours**
Small mines(53 + 17)	**=**	**70 hours**
Hours for Weekly Inspections		**5,005 hours**
Burden Hour Annual Costs for Weekly Inspections		
Large mines ($96,265 + $32,075)	**=**	**$128,340**
Small mines ($1,378 + $459)	**=**	**$ 1,837**
Cost for Weekly Inspections	**=**	**$130,177**
Manufacturer Recommended Inspections & Record Burden Hours		
Large mines (592 + 49)	**=**	**641 hours**
Small mines (11 + 1)	**=**	**12 hours**
Hours for Manufacturer Recommended Inspections		**653 hours**
Burden Hour Annual Costs for Manufacturer Recommended Inspections		
Large mines ($47,392 + $3,947)	**=**	**$51,339**
Small mines ($848 + $70)	**=**	**$ 918**
Costs for Manufacturer Recommended Inspections	**=**	**$52,257**
TOTAL BURDEN HOURS AS REQUIRED BY § 75.1911(i)&(j)		
Weekly and Manufacturer Recommended Inspection and Record Burden Hours		
Large mines (4,935 + 641)	**=**	**5,576 hours**
Small mines (70 + 12)	**=**	**82 hours**
Total Hours		**5,658 hours**
Burden Hour Annual Costs Related to Weekly and Manufacturer Recommended Inspection and Record Burden Hours		
Large mines ($128,340 + $51,339)	**=**	**$179,679**
Small mines ($1,837 + $918)	**=**	**$ 2,755**
Total Costs	**=**	**$182,434**

Sections 75.1912(h)&(i) Permanent storage facilities. When inspecting permanent diesel fuel storage facilities, a record is required for each fire suppression system inspection where a defect was found. The record must include the facility examined, defect found, and corrective action taken. With respect to recordkeeping concerning the inspections done in § 75.1912(h), MSHA estimates that 10% of the inspections will show a defect exists. Each record, including maintaining, is estimated to take 5 minutes (0.0833 hrs). Weekly inspections are estimated to take 30 minutes (0.5 hrs.) by a person earning $26 per hour and manufacturer recommended inspections are estimated to take 1 hour based upon a $80 per hour inspection rate.

Inspection Burden Hour Time Related to Records from Weekly Inspections

(20 storage fac. in large mines x 1 inspection per week x 50 weeks per year x 0.10 inspections finding defects) x 0.5 hours = **50** hours

(5 storage fac. in small mines x 1 inspection per week x 40 weeks per year x 0.10 inspections finding defects) x 0.5 hours = **10** hours

Weekly Inspection Recordkeeping Burden Hours

(20 storage fac. in large mines x 1 inspection per week x 50 weeks per year x 0.10 inspections finding defects) x 0.0833 hours = **8** hours

(5 storage fac. in small mines x 1 inspection per week x 40 weeks per year x 0.10 inspections finding defects) x 0.0833 hours = **2** hours

Burden Hour Annual Costs Related to Inspection Burden Hour Time from Weekly Inspections

(20 storage fac. in large mines x 1 inspection per week x 50 weeks per year x 0.10 inspections finding defects) x 0.5 hours x $26 wage = **$1,300**

(5 storage fac. in small mines x 1 inspection per week x 40 weeks per year x 0.10 inspections finding defects) x 0.5 hours x $26 wage = **$260**

Burden Hour Annual costs Related to Weekly Inspection Recordkeeping Burden Hours

(20 storage fac. in large mines x 1 inspection per week x 50 weeks per year x 0.10 inspections finding defects) x 0.0833 hours x $26 wage = **$225**

(5 storage fac. in small mines x 1 inspection per week x 40 weeks per year x 0.10 inspections finding defects) x 0.0833 hours x $26 wage = **$50**

75.1912(h)&(i) CONTINUED ON NEXT PAGE

Inspection Burden Hour Time Related to Records from Manufacturer Recommended Inspections

(20 storage fac. in large mines x 2 inspections per year x 0.10 inspections finding defects) x 1 hour = **4** hours

(5 storage fac. in small mines x 2 inspections per year x 0.10 inspections finding defects) x 1 hour = **1** hour

Manufacturer Recommended Inspection Recordkeeping Burden Hours

(20 storage fac. in large mines x 2 inspections per year x 0.10 inspections finding defects) x 0.0833 hours = **1** hour

(5 storage fac. in small mines x 2 inspections per year x 0.10 inspections finding defects) x 0.0833 hours = **1** hour

Burden Hour Annual Costs Related to Inspection Burden Hour Time for Manufacturer Recommended Inspections

(20 storage fac. in large mines x 2 inspections per year x 0.10 inspections finding defects) x 1 hour x $80 inspection rate per hr. = **$320**

(5 storage fac. in small mines x 2 inspections per year x 0.10 inspections finding defects) x 1 hour x $80 inspection rate per hour = **$80**

Burden Hour Annual costs related to Manufacturer Recommended Inspection Recordkeeping Burden Hours

(20 storage fac. in large mines x 2 inspections per year x 0.10 inspections finding defects) x 0.0833 hours x $80 inspection rate per hour = **$26**

(5 storage fac. in small mines x 2 inspections per year x 0.10 inspections finding defects) x 0.0833 hours x $80 inspection rate per hour = **$10**

75.1912(h)&(i) CONTINUED ON NEXT PAGE

75.1912(h)&(i) CONTINUED

Weekly Inspection and Record Burden Hours		
Large mines (50 + 8)	**=**	**58 hours**
Small mines(10 + 2)	**=**	**12 hours**
Hours for Weekly Inspections		**70 hours**
Burden Hour Annual Costs Related to Weekly Inspections		
Large mines ($1,300 + $225)	**=**	**$1,525**
Small mines ($260 + $50)	**=**	**$ 310**
Costs for Weekly Inspections	**=**	**$1,835**
Manufacturer Recommended Inspections & Record Burden Hours		
Large mines (4 + 1)	**=**	**5 hours**
Small mines (1 + 1)	**=**	**2 hours**
Hours for Manufacturer Recommended Inspections		**7 hours**
Burden Hour Annual Costs Related to Manufacturer Recommended Inspections		
Large mines ($320 + $26)	**=**	**$346**
Small mines ($80 + $10)	**=**	**$ 90**
Costs for Manufacturer Recommended Inspections	**=**	**$436**
TOTAL BURDEN HOURS AS REQUIRED BY § 75.1912(h)&(i)		
Weekly and Manufacturer Recommended Inspection and Record Burden Hours		
Large mines (58 + 5)	**=**	**63 hours**
Small mines (12 + 2)	**=**	**14 hours**
Total Hours		**77 hours**
Burden Hour Annual Costs Related to Weekly and Manufacturer Recommended Inspection and Record Burden Hours		
Large mines ($1,525 + $346)	**=**	**$1,871**
Small mines ($310 + $90)	**=**	**$ 400**
Total Costs	**=**	**$2,271**

Sections 75.1914(f)(1)(2)&(h) require that weekly examinations be performed on diesel-powered equipment. Only in those exams where a defect is found must a record be made. The record must include machine examined, defect found and corrective action taken. MSHA estimates that it will take 2 hours to examine permissible equipment, 30 minutes (0.5 hours) to examine nonpermissible heavy-duty equipment, and 15 minutes (0.25 hours) to examine nonpermissible light-duty equipment. MSHA estimates that 25 percent of the time an examination will show a defect. There are 2,928 pieces of existing permissible and nonpermissible diesel-powered equipment, of which 2,878 pieces are in large mines and 50 pieces are in small mines. Of the 2,878 pieces in large mines 542 pieces are permissible, 505 are nonpermissible heavy-duty pieces, and 1,831 are nonpermissible light-duty pieces. Of the 50 pieces in small mines, 25 pieces are permissible, 12 are nonpermissible heavy-duty pieces, and 13 are nonpermissible light-duty pieces. Exams are once per work week (50 work weeks per year in large mines and 40 work weeks per year in small mines). Labor is valued at $26 per hour. MSHA estimates that it will take 5 minutes (or 0.0833 hours) for the record, including maintenance of records as required by paragraph (h), by a person earning $26 per hour.

Burden Hours for Exams:

In large mines

(((542 permissible pieces x 2 hours) + (505 nonpermissible heavy-duty pieces x 0.5 hours) + (1,831 nonpermissible light-duty pieces x 0.25 hours)) x 0.25)
x 50 weeks = **22,428** hours

In small mines

(((25 permissible pieces x 2 hours) + (12 nonpermissible heavy-duty pieces x 0.5 hours) + (13 nonpermissible light-duty pieces x 0.25 hours)) x 0.25)
x 40 weeks = **593** hours

23,021 hours

Recordkeeping Burden Hours:

In large mines

(((542 permissible pieces + 505 nonpermissible heavy-duty pieces + 1,831 nonpermissible light-duty pieces) x 0.25) x 50 weeks x 0.0833 hours = **2,997** hours

In small mines

(((25 permissible pieces + 12 nonpermissible heavy-duty pieces + 13 nonpermissible light-duty pieces) x 0.25) x 40 weeks x 0.0833 hours = **42** hrs.

3,039 hrs.

Sections 75.1914(f)(1),(f)(2)&(h) continued

Burden Hour Annual Costs Related to Exams:

In large mines

(((542 permissible pieces x 2 hours) + (505 nonpermissible heavy-duty pieces x 0.5 hours) + (1,831 nonpermissible light-duty pieces x 0.25 hours)) x 0.25) x 50 weeks x $26 wage = **$583,150**

In small mines

(((25 permissible pieces x 2 hours) + (12 nonpermissible heavy-duty pieces x 0.5 hours) + (13 nonpermissible light-duty pieces x 0.25 hours)) x 0.25) x 40 weeks x $26 wage = **$ 15,400**

$598,550

Recordkeeping Burden Hour Annual Costs:

In large mines

(((542 permissible pieces + 505 nonpermissible heavy-duty pieces + 1,831 nonpermissible light-duty pieces) x 0.25) x 50 weeks x 0.0833 hours x $26 wage = **$77,925**

In small mines

(((25 permissible pieces + 12 nonpermissible heavy-duty pieces + 13 nonpermissible light-duty pieces) x 0.25) x 40 weeks x 0.0833 hours x $26 wage = **$ 1,100**

$79,025

75.1914(f)(1),(f)(2)&(h) BURDEN HOURS: 23,020 + 3,038 = 26,058
75.1914(f)(1),(f)(2)&(h) BURDEN COSTS: $598,550 + $79,025 = $677,575

Sections 75.1914(g)&(h) require mine operators to develop standard operating procedures for testing undiluted diesel exhaust emissions. It is estimated to take 2 hours of a supervisor's time (valued at $37.35 per hour) to develop and maintain the testing procedures as required by paragraphs (g)&(h). Written procedures will be similar for diesel-powered equipment that are of the same model, but will vary when the diesel machines are different models. On average, there are 4 to 5 (average of 4.5) different diesel machine models in large mines and about 2 different models in small mines. All 158 large and 15 small mines are affected by this provision. Initial costs are annualized at 7 percent.

One Time Burden Hours for Program to Test Undiluted Diesel Exhaust Emissions:

158 large mines x 4.5 models x 2 hours	=	**1,422** hours
15 small mines x 2 models x 2 hours	=	**60** hours
		1,482 hours

One Time Burden Hour Annualized Costs for Program to Test Undiluted Diesel Exhaust Emissions:

158 large mines x 4.5 models x 2 hours x $37.35 wage x 0.07	=	**$3,718**
15 small mines x 2 models x 2 hours x $37.35 wage x 0.07	=	**$ 157**
		$3,875

Note: The 1,482 hours will only occur the first year that the rule is in effect. After the first year, burden hours to develop and maintain a program will drop because it is estimated that 5 large mines per year and 1 small mine every 3 years will introduce diesel-powered equipment into their mine and thus the number of programs will be less each year.

Burden Hours for Program To Test Undiluted Diesel Exhaust Emissions - After the First Year:

5 large mines x 4.5 models x 2 hours	=	**45** hours
(1 small mine x 2 models x 2 hours)/3 years	=	**1** hours
		48 hours

Burden Hour Annual Costs for Program to Test Undiluted Diesel Exhaust Emissions - After the First Year:

5 large mines x 4.5 models x 2 hours x $37.35 wage	=	**$1,681**
[(1 small mine x 2 models x 2 hours)/3 years] x 37.35 wage	=	**$ 50**
		$1,731

Sections 75.1914(g)(5)&(h) require that records be kept concerning weekly exams and tests of the undiluted exhaust emissions on certain pieces of diesel-powered equipment tested. This test will be done weekly on 1,047 diesel machines in large mines (542 permissible and 505 heavy-duty) and, 37 diesel machines in small mines (25 permissible and 12 heavy-duty). For each piece of tested equipment, it takes 10 minutes (0.1667 hours) to set up and do the test by a miner earning $31 per hour; and 5 minutes (0.0833 hours) to make and retain the record required by paragraphs (g)(5)&(h).

As a result of this provision, mines will need to purchase equipment. Equipment costs for this provision are in question 13.

Exam Burden Hours:

1,047 diesel pieces in large mines x 50 weeks x 0.1667 hours	=	**8,727** hours
37 diesel pieces in small mines x 40 weeks x 0.1667 hours	=	**247** hours
		8,974 hours

Burden Hour Annual and Annualized Costs for Exam:

[(1,047 diesel pieces in large mines x 50 weeks x 0.1667 hours x $31 wage)	=	**$270,529**
[(37 diesel pieces in small mines x 40 weeks x 0.1667 hours x $31 wage)	=	**$ 7,648**
	=	**$278,177**

[Costs for equipment shown below under heading titled "Equipment Costs".]

Recordkeeping Burden Hours:

1,047 diesel pieces in large mines x 0.0833 hours x 50 weeks	=	**4,361** hours
37 diesel pieces in small mines x 0.0833 hours x 40 weeks	=	**123** hours
		4,484 hours

Burden Hour Annual Costs for Recordkeeping Burden Hours:

1,047 diesel pieces in large mines x 0.0833 hours x 50 weeks x $31 wage	=	**$135,183**
37 diesel pieces in small mines x 0.0833 hours x 40 weeks x $31 wage	=	**$ 3,822**
		$139,005

75.1914(g)(5)&(h):
Total Burden Hours: 8,973 + 4,483 = 13,456 hrs.
Tot Burden costs: $405,712 + $11,470 = $417,182

Section 75.1915(a) requires that training be provided in order for persons to be qualified to perform maintenance, repairs, examinations and tests on diesel-powered equipment. The burden hours to write such a training program are recorded in § 75.1915(b)(5). Section 75.1915(a) concerns the burden hours related to the mine operator giving the training. MSHA assumes that 5 hours of training will be provided by an instructor on each type of diesel-powered equipment in the mine. The supervisory person's wage is $37.35 per hour. MSHA determined that, on average, there are 8 different kinds of diesel-powered equipment in a large mine and 2 in a small mine. The training will be provided on an annual basis in a large mine in order to account for miner turnover.

Burden Hours Related to Training:

158 large mines x 8 different kinds of diesel machines x 5 training hours x 1 supervisor	=	**6,320** hours
15 small mines x 2 different kinds of diesel machines x 5 training hours x 1 supervisor	=	**150** hours
		6,470 hours

Burden Hour Cost Related to Training:

158 large mines x 8 different kinds of diesel machines x 5 training hours x 1 supervisor x $37.35 wage	=	**$236,050**
15 small mines x 2 different kinds of diesel machines x 5 training hours x 1 supervisor x $37.35 wage x 0.07	=	**$ 400**
		$236,450

Sections 75.1915(b)(5)&(c) require that the mine operator develop an initial and retraining program in order that persons be qualified to perform maintenance, repairs, examinations and tests on diesel-powered equipment. Paragraph (c) sets forth requirements concerning the record. It will take 16 hours in a large mine and 10 hours in a small mine to develop and maintain the training program as required by paragraphs (b)(5)&(c). The plan will be developed by a supervisor earning $37.35 per hour. The one time costs are annualized at 0.07 percent.

One Time Burden Hours for Training Plan

158 large mines x 16 hours	=	**2,528** hours
15 small mines x 10 hours	=	**150** hours
		2,678 hours

One Time Burden Hour Annualized Costs of Plan

158 large mines x 16 hours x $37.35 wage x 0.07	=	**$6,600**
15 small mines x 10 hours x $37.35 wage x 0.07	=	**$ 400**
		$7,000

Note: The 2,678 hours will only occur the first year that the rule is in effect. After the first year, the burden hours for this provision will drop because it is estimated that 5 large mines per year and 1 small mine every 3 years will introduce diesel-powered equipment into their mine.

Development of Training Plan Burden Hours After the First Year

5 large mines x 16 hours	=	**80** hours
(1 small mine x 10 hours)/3 years	=	**3** hours
		83 hours

Burden Hour Annual Cost of Plan After the First Year

5 large mines x 16 hours x $37.35 wage	=	**$3,000**
[(1 small mines x 10 hours)/3 years] x $37.35 wage	=	**$ 125**
		$3,125

Equipment Costs

Section 75.363 To make the record of sampling results required by § 75.363 noted in question 12, mine operators will have to purchase an instantaneous gas analyzer that costs about $1,475 per instrument. As noted in § 75.363 in question 12, about 100 large mines and 10 small mines will be affected. The sampling devices will last 10 years and thus, costs are annualized at 0.142. The devices need to be maintained and calibrated at a costs of $345 per year.

Annualized Equipment Costs For Large Mines		
$1,475 x 100 large mines x 0.142	=	**$20,945**
Annual Calibration Costs For Large Mines		
$345 x 1 device x 100 large mines	=	**$34,500**

Annualized Equipment Costs For Small Mines		
$1,475 x 10 small mines x 0.142	=	**$2,095**
Annual Calibration Costs For Small Mines		
$345 x 1 device x 10 small mines	=	**$3,450**

Section 75.1914(g)(5)&(h) To make records from weekly exams and tests of the undiluted exhaust emissions required by § 75.1914(g)(5)&(h) in question 12, mines will need to purchase an instantaneous gas analyzer that costs about $1,475 per instrument. All 158 large mines and 15 small mines are affected. The sampling devices will last 10 years and thus, costs are annualized at 0.142. The devices need to be maintained and calibrated at a costs of $345 per year.

Annualized Equipment Costs For Large Mines		
[$1,475 x 158 large mines x 0.142]	=	**$33,093**
Annual Calibration Costs For Large Mines		
[$345 x 1 device x 158 large mines]	=	**$54,510**

Annualized Equipment Costs For Small Mines		
$1,475 x 15 small mines x 0.142	=	**$3,142**
Annual Calibration Costs For Small Mines		
[$345 x 1 device x 15 small mines]	=	**$5,175**

Decrease in Burden Hours

As result of the promulgation of part 7, subparts E and F certain applications file by manufacturers that previously have been filed under part 36 and 32 will now have to be filed under Part 7. In addition, this final rule will eliminate part 32. Thus, there will be decreased burden hours for part 32 and 36 that are shown below.

PART 36 The final rule requires manufacturers to file applications for approval of new permissible engine models that need a maximum fuel/air ratio test and gaseous ventilation test under part 7, subpart E, instead of under existing Part 36 regulations. Thus, there will be a decrease in part 36 burden hours.

Reduction in Part 36 Burden Hours
1.5 applications per year seeking approval for new permissible engine models x 43 hours = **65 hours**

Cost:
The burden hours for part 36 was developed under the Paperwork Reduction Act of 1980 (PRA-80). PRA-80 did not require costs to be reported with burden hours. Thus, no compliance costs are noted here.

Part 32 The final rule requires manufacturers to file applications for approval of new nonpermissible engine models that need a maximum fuel/air ratio test and gaseous ventilation test under Part 7, subpart E, instead of under part 32 regulations.

The promulgation of this final rule will result in the deletion of the entire part 32, thus all burden hours associated with part 32 are deleted below.

Reduction in Part 32 Burden Hours
Delete all 102 part 32 burden hours contained in OMB Control No. 1219-0066. (Note: the entire control number cannot be deleted because it contains other regulations.
= **102 hours**

Cost:
The burden hours for part 32 was developed under the Paperwork Reduction Act of 1980 (PRA-80). PRA-80 did not require costs to be reported with burden hours. Thus, no compliance costs are noted here.

PART 36 The final rule requires manufacturers to file applications for approval for power packages on new permissible engine models under Part 7, subpart F, instead of under existing Part 36 regulations. Thus, there will be a decrease in part 36 burden hours.

Reduction in Part 36 Burden Hours
1.5 applications per year for
new permissible power package models
x 43 hours = **65 hours**

Cost:
The burden hours for part 32 was developed under the Paperwork Reduction Act of 1980 (PRA-80). PRA-80 did not require costs to be reported with burden hours. Thus, no compliance costs are noted here.